UNIVERSITY OF ALBERTA

ROUTINE ACTIVITIES AND VANDALISM

BY

TERESA C. LAGRANGE

A thesis submitted to the Faculty of Graduate Studies and Research in partial fulfillment of the requirements for the degree of MASTER OF ARTS.

DEPARTMENT OF SOCIOLOGY

Edmonton, Alberta

FALL 1994

National Library of Canada
Acquisitions and Bibliographic Services Branch
395 Wellington Street
Ottawa, Ontario
K1A 0N4

Bibliothèque nationale du Canada
Direction des acquisitions et des services bibliographiques
395, rue Wellington
Ottawa (Ontario)
K1A 0N4

Your file Votre référence

Our file Notre référence

The author has granted an irrevocable non-exclusive licence allowing the National Library of Canada to reproduce, loan, distribute or sell copies of his/her thesis by any means and in any form or format, making this thesis available to interested persons.

L'auteur a accordé une licence irrévocable et non exclusive permettant à la Bibliothèque nationale du Canada de reproduire, prêter, distribuer ou vendre des copies de sa thèse de quelque manière et sous quelque forme que ce soit pour mettre des exemplaires de cette thèse à la disposition des personnes intéressées.

The author retains ownership of the copyright in his/her thesis. Neither the thesis nor substantial extracts from it may be printed or otherwise reproduced without his/her permission.

L'auteur conserve la propriété du droit d'auteur qui protège sa thèse. Ni la thèse ni des extraits substantiels de celle-ci ne doivent être imprimés ou autrement reproduits sans son autorisation.

ISBN 0-315-94871-X

Canada

UNIVERSITY OF ALBERTA

RELEASE FORM

NAME OF AUTHOR: TERESA C. LAGRANGE

TITLE OF THESIS: ROUTINE ACTIVITIES AND VANDALISM

DEGREE: MASTER OF ARTS

YEAR THIS DEGREE GRANTED: 1994

Permission is hereby granted to the University of Alberta Library to reproduce single copies of this thesis and to lend or sell such copies for private, scholarly or scientific research purposes only.

The author reserves all other publication and other rights in association with the copyright in the thesis, and except as hereinbefore provided neither the thesis nor any substantial portion thereof may be printed or otherwise reproduced in any material form whatever without the author's prior written permission.

Teresa C. LaGrange

Teresa C. LaGrange
Department of Sociology
University of Alberta
Edmonton, Alberta

Dated: June 23, 1994

UNIVERSITY OF ALBERTA

FACULTY OF GRADUATE STUDIES AND RESEARCH

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research for acceptance, a thesis entitled ROUTINE ACTIVITIES AND VANDALISM submitted by TERESA C. LAGRANGE in partial fulfillment of the requirements for the degree of MASTER OF ARTS.

R. A. Silverman, Ph.D.

H. Northcott, Ph.D.

R. C. Macleod, Ph.D.

June 17, 1994

ABSTRACT

Efforts to explain vandalism are often founded on motivational theories that examine factors which distinguish between offenders and non-offenders. These explanations are hampered by the fact that a majority of young males admit to committing occasional vandalism. However, "routine activities" theory points out that motivation alone is not sufficient to result in criminal events, and focuses instead on the proximate factors of available targets and unguarded access which permit potential offenders to translate their inclinations into action. Using this perspective as a theoretical foundation, this study examines the incidence of vandalism as it was reported during a one-year period in Edmonton, Alberta. Mapping software was employed to identify the locations of all incidents of vandalism recorded by two City departments, and all mischief incidents recorded by City Police. The number of incidents was aggregated according to the City Enumeration boundaries, and stepwise multiple regression was used to analyze the impact of the residential environment and physical structures including shopping malls and secondary schools. Common factors identified for all three measures include substantially higher levels of vandalism in areas which contain a shopping mall, those which contain a high school, and areas characterized by high unemployment and high rental occupancy. These findings are interpreted as reflecting the weakened social control that is found in these areas, as a consequence of the convergence of potential offenders and the weakened guardianship arising from characteristic patterns of human activity.

ACKNOWLEDGMENTS

I am indebted to a number of agencies and persons who made contributions to the research which is contained in this thesis. Financial support was provided by a grant from the University of Alberta Central Research Fund and a grant from the Edmonton Department of Parks and Recreation. Additional financial support came from the Department of Sociology at the University of Alberta, and indirectly from the Solicitor General of Canada through its Contributions Grant to the Centre for Criminological Research at the University of Alberta.

The Edmonton Police Service, Edmonton Transit, and the Edmonton Department of Parks and Recreation provided the data for this study. Special thanks are due to Iqbal Jamal of the Edmonton Police Service Research Department; Darlene Kowalchuk, Security and Risk Management Administrator for Edmonton Transit; and Wayne Gorman, Security and Risk Management Administrator of Edmonton Parks and Recreation. Their cooperation in taking time away from their own responsibilities to compile the data and supporting information was invaluable. In addition, I would like to thank Howard Moster of the City of Edmonton's Risk Management and Corporate Security Office and the other members of the Edmonton Vandalism Prevention Committee, who generously furnished me with unpublished material from their own files, and who served as the impetus for this study.

Assistance and advice on the intricacies involved in the mapping of different types of data were freely given by Janet Meunir and Michael Kwan of the City of Edmonton's Computing Resources Department. At the University of Alberta, Dave Odnyak of the Population Research Laboratory assisted in countless ways, from obtaining the mapping software to offering suggestions on the technical problems encountered in the statistical analysis.

Finally, I am grateful to several people without whose assistance this thesis could not have been completed. I am particularly indebted to my supervisor, Dr. R. A. Silverman, for his advice and encouragement throughout the various stages of the project. Thanks are due also to the members of my committee, for their helpful comments. And special thanks must go to my family, who patiently tolerated my inattention and general preoccupation during the writing process.

In spite of their substantial contributions, of course, the above persons cannot be blamed for any mistakes; all errors or omissions are my own.

TABLE OF CONTENTS

I. CHAPTER 1. INTRODUCTION

A. The problem of vandalism 1

B. Theoretical perspectives 3

1. Traditional perspectives 3

2. Routine activities theory 5

C. Objectives of the present research 6

D. Organization of the thesis 7

II. CHAPTER 2. PREVIOUS LITERATURE AND THEORY

A. The nature and extent of vandalism 8

B. The spatial distribution of crime and routine activities theory 12

1. Social characteristics of residents 13

2. Social structural factors 14

3. Physical structures in the environment 16

C. Routine activities and vandalism. 18

D. Hypotheses 22

E. Understanding the behaviour: the issue of causation 22

III. CHAPTER 3. MEASUREMENTS AND METHOD

A. Dependent variable 24

1. Mischief incidents 24

2. Transit vandalism 27

3. Parks and recreation vandalism 28

4. Measurement of vandalism by area 28

B. Census enumeration areas 31
1. Age and gender. 32
2. Environmental structures 32

IV. CHAPTER 4. DATA AND RESULTS
A. Descriptive statistics 35
1. The city 35
2. Vandalism 36
B. Regression analysis of vandalism 42
1. Regression analysis of mischief 43
2. Regression analysis of transit vandalism. 51
3. Regression analysis of park vandalism. 55
4. Unemployment and rental occupancy 58
C. Testing the hypotheses. 60

V. CHAPTER 5. DISCUSSION AND CONCLUSION
A. Discussion. 63
B. Routine activities and vandalism. 66
1. The residential environment and guardianship 66
C. Conclusion. 71
1. Social control and the ecology of crime. 71
2. Implications. 72

REFERENCES. 76

APPENDIX A: GEOCODING OF DATA 85

APPENDIX B: VARIABLES USED IN THE ANALYSIS 88

APPENDIX C: SECONDARY SCHOOLS 90

APPENDIX D: MALLS 93

APPENDIX E: CHOROPLETH MAPS 94

APPENDIX F: MAPS 96

LIST OF TABLES

Table 1. Descriptive statistics 35

Table 1A. Descriptive statistics of transformed dependent variables 42

Table 2. Correlation coefficients (mischief) 44

Table 3. Regression of mischief 46

Table 4A. Regression of mischief (high rental) 48

Table 4B. Regression of mischief (low rental) 48

Table 5A. Regression of mischief (high unemployment) 50

Table 5B. Regression of mischief (low unemployment) 50

Table 6. Correlation coefficients (transit) 52

Table 7. Regression of transit vandalism 53

Table 8A. Regression of transit vandalism (high rental) 54

Table 8B. Regression of transit vandalism (low rental) 55

Table 9. Correlation coefficients (park) 56

Table 10. Regression of park vandalism 57

Table 11. Regression of proportion rentals 59

LIST OF FIGURES

Figure 1. Proposed model predicting vandalism 21

Figure 2. Mischief incidents 37

Figure 3. Transit vandalism. 39

Figure 4. Park vandalism. 41

Figure 5. Revised model predicting vandalism 70

Figure 6. Mischief incidents and locations of malls and schools 97

Figure 7. Transit vandalism and locations of malls and schools 98

Figure 8. Park vandalism and locations of malls and schools. 99

CHAPTER 1

INTRODUCTION

THE PROBLEM OF VANDALISM

Vandalism is not a new phenomenon, exclusive to modern society. Documented incidents have cropped up in all historical periods, a statement attested to by the discovery of what appears to be graffiti on the ruined walls of Pompeii (Roos 1992:73). However, like the wanton plundering of Rome by the Vandals in the early Middle Ages which gave rise to the term "vandalism," these pre-modern incidents of vandalism appear to have been memorable but sporadic (van Vliet 1992: 35).[1] What is new about vandalism in contemporary cities is its ubiquity: vandals leave their handiwork everywhere, and do so persistently and continually. In the last three decades, municipalities and communities throughout the Western world have experienced what has been described as an epidemic of broken windows, graffiti, flooded washrooms, smashed payphones, and a myriad other seemingly senseless acts of damage (Challinger 1987; Clarke 1978; European Conference 1989; Hough and Mayhew 1980; Levy-Leboyer 1984).

Media reports often highlight the most dramatic of these episodes. A recent California newspaper article reported that "[v]andals have spray-painted a Highway 101 sign protected by razor wire for the fourth time this year." The writer described how the vandals must have clambered "monkeylike above traffic lanes and through reinforced razor wire barriers" in order to gain access to their overpass target (Green 1993). A news release from Florida relates that four school children, all under twelve years old, broke into a local elementary school, causing "about $100,000 in damage to classrooms and computer equipment" (Lindberg 1994). In Canada, a story from Mississauga, Ontario describes a similar overnight incident, in which unknown vandals trashed classrooms and left an estimated $40,000 in damage (Ferenc 1993). Incidents like these are reported from all over the world, ranging from the Netherlands to Canberra, New South Wales.

In spite of the media attention given to them, however, these spectacular events are not representative of contemporary vandalism. Most of the damage in modern cities results from a multitude of relatively minor acts: a message gouged in a park bench or bus shelter, a handful of light bulbs broken in a school, a

---

[1] The dramatic increase in vandalism from "a trickle of acts . . . [to] a torrent of flood-like proportions" is generally traced to the decades following World War II (Simpson and Hagan 1985; Thayer 1981; see also Roos 1992). While this assertion may be empirically documented with some assurance for the 20th century, however, it is impossible to determine with any certainty how much vandalism occurred in earlier eras.

shattered window. Each incident by itself is annoying, but does not usually entail a large cost for repairs. The cumulative effect of thousands of such incidents each year, however, is enormous, and results in far greater damage than the dramatic, isolated rampages highlighted by the media. Estimates on the cost of repairing damages vary widely. Although it is impossible to arrive at an accurate figure, because these costs are often absorbed in routine maintenance budgets and thus are not recorded specifically as vandalism, figures are consistently high. An estimate by the RCMP several years ago suggested that Canadians spend, through various agencies and public institutions, over $100 million per year for such repairs (Simpson and Hagan 1985).

The media coverage given to sensational cases contributes to public concern with the "vandalism problem." Vandalism is not the most serious crime problem facing most communities; even where it is especially prevalent, it is rarely a threat to public safety. It differs from other crimes, however, in its visibility. The occurrence of a robbery or rape on a particular street may leave no trace after the fact, so that the site seems innocuous and safe to passerby only a few hours later. The damage caused by vandalism, on the other hand, may remain undisturbed for days or even months. In some areas, often high-rental, low-income neighbourhoods where absentee property owners do not carry out immediate repairs, the ravages of vandalism accumulate to create an aura of neglect and urban decay. This situation, in turn, contributes to a public perception that crime in general is rampant, that "no one is in control, and anything can happen" (Glazer 1981, as cited in Chalfant 1992:7).

The public attitude about vandalism is well illustrated by the response to a California newspaper's story about a thirteen-year-old boy who was killed while engaged in a "graffiti expedition" along a freeway median (Bortnick 1994: A1). "Reaction," observed a shocked columnist, was "swift and. . .brutal," as the newspaper was inundated with letters to the editor (Chavarria 1994: B1). One reader suggested that "'D.O.A.' ought to be spray-painted in huge, block, neon letters" on the body of the dead vandal. Another felt that vandalism would be dramatically reduced if people were permitted to shoot perpetrators on sight. These draconian suggestions are a clear indication of the growing public disgust with urban vandalism. A *Newsweek* public opinion survey undertaken in response to a highly-publicized case involving an American youth convicted of vandalism in Singapore found that 38% of those polled favoured the caning to which the hapless youth was sentenced (Elliott 1994:21). Public willingness to condone such an archaic penalty, which some observers have equated with torture, gives further testimony to the sense of public outrage over vandalism as a *visible symbol of youth crime in general.*

The high tide of public indignation, together with the soaring costs of repairs, has given new impetus to the search for effective vandalism prevention policies. And there is no shortage of programs, espoused by their advocates as being useful to curb vandalism. A plethora of books and articles on the topic have been published, with the result that a broad array of possible approaches exists (Beaulieu 1981; Clarke 1978; Geason and Wilson 1990; Walop 1988). The question is, however, which ones are actually effective? As one British researcher petulantly remarked fifteen years ago:

> Should one try to instill more respect for property in the young? Should parents be exhorted to exercise greater supervision over their children's movements and should schools be encouraged to exercise firmer discipline? Should there be more youth clubs, adventure playgrounds, and sports facilities to give vandals greater outlets for their energies? Should the police be encouraged to pay more attention to the problem and the courts to be tougher on the vandals who are caught? Should vandals be given 'treatment' by psychologists and social workers? or should we merely make it more difficult for damage to be committed through better design of property and by using stronger materials? (Clarke 1978:3)

The answers to these questions depend on a clear understanding of the dynamics of the behaviour itself; and unfortunately there has been little theoretical or empirical exploration of vandalism. Choices of what policies might best be adopted are often predicated more on the fiscal balance sheet, or on the vagaries of public outrage, than they are on any notions of why vandalism occurs, and hence what might be the most effective strategy to reduce it.

THEORETICAL PERSPECTIVES

Traditional perspectives

One of the central reasons for this confusion is the theoretical perspective from which vandalism has been approached. Where explanations have been undertaken, they have focused almost exclusively on the offenders. Not surprisingly, most researchers agree that young males, particularly those in their teens and pre-teens, are responsible for the greatest bulk of vandalism. This contention is well-supported, both from offender profiles on the few who are caught and by self-report studies of broad samples of adolescents. Moreover, the relationship between

gender, age and crime has been thoroughly documented for decades: young males commit the majority of all crimes, and younger offenders are most likely to commit less serious offenses, particularly property offenses.

However, moving beyond these preliminary observations about the most likely offenders in an effort to develop a theoretical model which can be used to predict vandalism has thus far met with little success. Although some theorists have proposed typologies of motivation, identifying such distinctions as acquisitive vandalism, vindictive vandalism, play vandalism, ideological vandalism and so forth, these schemes are complex and founded on sometimes-obscure individual and psychological factors (Cohen 1973). If these types could be empirically linked to specific behaviours or patterns of offence, thereby shedding some light on the dynamics that produce vandalism or that distinguish between types, they would be useful concepts; but unfortunately they have yet to be so linked.

More often, previous research on vandalism has not examined it as a specific behaviour, but instead has viewed it as a facet of more general delinquency. And the emphasis on offenders and their motivation which characterizes efforts at explaining vandalism reflects, in turn, the dispositional focus of criminology in general. Although early work in the discipline--particularly as it evolved and was refined in the work of the Chicago school--emphasized macro-level analyses and structural processes, these theoretical approaches have been largely supplanted by an emphasis on the sources of individual motivation to crime (Bursik 1988: 523; Clarke and Mayhew 1980). The prominent theories of criminogenesis trace the sources of criminality to biological, emotional, psychological or sociological influences in the individual make-up of the offender. These factors, in turn, are attributed variously to pre-natal or early childhood experiences, defective socialization, subcultural aberrations, or various other processes. Crime is seen to occur because some persons are motivated to commit it; "come what may, they will seek out their opportunities in crime" (Clarke and Mayhew 1980: 3). It follows from this perspective that a central goal of theory is the ability to distinguish those who are criminally inclined from those who are not. Indeed, the crucible within which a theory of crime is often refined (and sometimes discarded) consists of testability: the extent to which empirical research founded upon its propositions can successfully predict who will be criminal.

Yet motivational explanations have thus far proven disappointing as a way of understanding or predicting vandalism. Early self-report studies of delinquency revealed that a large majority of youths surveyed admit to having committed at least one act of property damage during the time period covered by the study (Elliott and Ageton 1979; Erickson and Empey 1963; Gold 1970; Hindelang, Hirschi and Weis 1979; Short and Nye 1957). A handful of studies which have examined vandalism

in more depth have found that as many as 80 to 90% of respondents admit to the occasional act of vandalism (Beaulieu 1982; Gladstone 1978). Attempts to understand or predict vandalism which focus exclusively on characteristics which lead to individual motivation and distinguish offenders from non-offenders, therefore, may be fruitless because almost any young person may be a "vandal" at one time or another.

Routine activities theory

Contemporary perspectives on crime, however, have demonstrated that even a highly-motivated offender does not commit a crime unless the immediate situation permits him to do so. In order for a crime to occur the would-be offender needs a suitable target, and must encounter it in circumstances that permit unguarded access. Analyses of situational factors that include the routine activities of both likely offenders and potential victims has revealed that these requisite elements of a crime converge non-randomly in time and space: some targets are much more likely to be victimized than others. Application of these principles has been used to reveal non-random patterns in the occurrence of diverse types of crime, including homicide of elderly victims (Kennedy and Silverman 1991), and burglary (Felson and Cohen 1980).

Similarly, some places are much more likely to permit the occurrence of crime than others. Because of their social and physical environment, these locations, described as "hot-spots," regularly provide the opportunity for offenders and victims to converge under conditions of reduced guardianship (Sherman, Gartin and Buerger 1989). Although certain establishments such as bars are prominent examples of places which might function in this way, and areas in which they occur have been found to have elevated crime rates, some less obvious environmental features of a city have also been linked to higher crime rates in surrounding neighbourhoods (Engstad 1980). These include public high schools (Roncek and LoBosco 1983: Roncek and Faggiani 1985); and shopping malls (Engstad 1980), both of which serve to draw large masses of people, including would-be offenders, into their environs on a regular basis.

The routine activities perspective is derived from a view of crime as a rational activity that occurs as a consequence of the relative weighing of risks and benefits, and a response to opportunities. That opportunity may be a significant factor in the occurrence of vandalism has been previously acknowledged, with some writers contending that as much as three-quarters of vandalism arises as a spontaneous activity in response to immediate circumstances of opportunity (Geason and Wilson 1990). The extent to which vandalism is situational is also suggested by research

conducted on crime in public housing estates in Great Britain, which concluded that child density, or the proportion of children per housing block, was the single most significant factor in predicting levels of vandalism, overpowering the effects of all other variables including those of building design and socioeconomic factors (Wilson 1978). Similarly, a neighbourhood anti-graffiti campaign in Seattle, Washington found that the incidence of graffiti occurred in patterns closely associated with the daily routine activities of local teenagers, with highest levels observed along the bus routes to and from neighbourhood schools, and around convenience stores (Bell, Bell and Godefroy 1988).

OBJECTIVES OF THE PRESENT RESEARCH

These studies, while of limited scope either in terms of the dependent variable examined or in the social or physical environment considered, give some preliminary indications about the nature of vandalism and provide the impetus for the present research. The primary objective of the study which is reported in the pages that follow is to examine the incidence of vandalism on a city-wide basis, using a theoretical framework derived from routine activities theory. Using a macro-level analysis which takes census enumeration areas as the unit of aggregation, vandalism as recorded in the City of Edmonton during the calendar year of 1992 is examined. Both social and environmental factors which are presumed to affect opportunity are considered in relationship to the convergence of the most likely offenders, young males. A second objective of this study is to evaluate the impact of shopping malls and secondary schools on vandalism in the surrounding or adjacent areas. Finally, because vandalism is considered to be a minor offence, one which is severely underreported, a third objective is to determine the similarity in patterns of vandalism recorded by three different source agencies: the City's Department of Parks and Recreation, Edmonton Transit, and Edmonton Police Service. The first two of these agencies, the Department of Parks and Recreation and the Transit Department, kept separate records of all vandalism incidents which occurred to the structures under their jurisdiction during the time period studied: vandalism which occurred in all parks, recreational facilities, and public grounds for the former, and vandalism to transit shelters for the latter. The third source agency, Edmonton Police Service, included reports of all incidents of Mischief recorded by City Police during the year.[2]

---

[2]The Canadian Criminal code does not contain a statute specifically dealing with vandalism. Where a vandalism incident is reported to police and recorded, the crime is usually recorded as "Mischief," either over or under $1000 (CC 430). Although this offence category is generally equivalent to vandalism, there are some acts which might be prosecuted under this section which would not be considered vandalism. In addition, some minor acts of vandalism would not be recorded as mischief; this

ORGANIZATION OF THE THESIS

In Chapter 2 of this thesis, previous literature on the nature and extent of vandalism is reviewed, and the implications of routine activities theory for predicting this type of crime are considered. Specific hypotheses suggested by this theory are used to evaluate the relevance of the theoretical perspective in explaining variations in vandalism throughout the city. Chapter 3 outlines the method used in the mapping of incidents reported by the contributing agencies, the operationalizing of the concepts and variables employed, and issues of measurement which arise in the use of these data sources as indicators of vandalism. In Chapter 4, the results obtained from this analysis are reported, and a multivariate analysis of the relationship between vandalism and the predictor variables is undertaken. Chapter 5 discusses these results, summarizes the findings, and addresses implications both for future research and for policy decisions for the contributing agencies.

---

latter issue, of mischief as a measure of vandalism, is discussed further in Chapter 3.

CHAPTER 2

PREVIOUS LITERATURE AND THEORY

THE NATURE AND EXTENT OF VANDALISM

Vandalism is defined variously by different writers. Moser, for example (1992), states that vandalism is "an intentional act aimed at damaging or destroying an object that is another's property," a definition which he proposes as a revision of Feshbach's earlier definition of vandalism as "an intentional hostile behaviour aimed at damaging environmental objects," thereby excluding the implication of hostility (Feshbach 1964; Moser 1992: 53). According to the United States' FBI, vandalism is "willful or malicious destruction, injury, disfigurement, or defacement of any public or private property, real or personal. . ." (Federal Bureau of Investigation 1985: 33). The City of Edmonton's officially endorsed definition is "destruction, defacement, or damage to any property, or other mischievous acts that result in a loss, where monetary profit is not a prime motive" (City of Edmonton Vandalism Committee 1992: August 5).

What these diverse definitions share is two central concepts: that vandalism is damage which occurs for its own sake, rather than as a consequence of another crime (such as theft); and that it be "wilful," "malicious," or "intentional." It is this latter distinction which has been the source of considerable controversy in vandalism research, and has contributed directly to the problems associated with motivational explanations. To assert that a behaviour was malicious or wilful is, by implication, to make a statement about the offender's intentions; and this cannot be readily determined by looking at the consequences of the behaviour after the fact. The bulk of research on vandalism has been initiated from the perspective of frequently-targeted agencies, rather than offenders; the motives of the vandals, or even whether or not the damage was intentional or accidental, can only be guessed at.

Research on known or potential offenders has often revealed little in the way of motivational explanations, focusing instead on the occurrence of the behaviour itself. Offender profiles reveal that the majority of apprehended vandals are young males, but very little else. In a 1978 study, Gladstone reports that of those charged with vandalism in the United Kingdom, 60% were in the age 10-20 age group, with the peak age being 14 to 16 years old; nine out of ten offenders were male (Gladstone 1978: 20). Based on an earlier study in Blackburn, England, Clarke identifies a somewhat younger age group, asserting that the peak age for those who had been brought to the attention of police for vandalism (as opposed to those actually charged) was less than 10 years (Clarke 1978: 69). In the United States,

43% of those charged with vandalism during 1986 were under the age of 18; another 29% were in the 18 to 25 age group. Ninety percent of these offenders, of all age groups, were male (Federal Bureau of Investigation 1987). Similar figures are reported in Canada, where 44% of those charged for vandalism in 1988 were young offenders. Ninety-five percent of known offenders, of all ages, were male (Silverman, Teevan and Sacco 1991: 249).

Although these figures consistently identify young males as the largest proportion of *apprehended* offenders, vandalism is a crime which is severely underreported and which results in few arrests. The proportion of offenders actually caught is, by necessity, presented only as a rough estimate; but there is general agreement that this figure is very low, not much higher than 10% (Geason and Wilson 1990; Gladstone 1978; van Vliet 1992). Hence, the sparsity of information that may be gained from material on offenders may seem irrelevant. Yet broader self-report studies of teenage populations do not contribute substantially more to understanding the behaviour. Again, the focus has been primarily on commission of the actions rather than immediate circumstances or factors which lead to its occurrence. The majority of questionnaires have not explored vandalism in detail, usually including only a single item relating to damage or destruction of property that is subsumed into broader definitions of delinquency. Nevertheless, the incidence of self-reported vandalism is consistently very high. In a study dating from the 1960s, Erickson and Empey found that 80% of respondents in a sample of boys aged 15-17 admitted to destroying property during the six months prior to the study (Erickson and Empey 1963). Similarly high rates of offence are reported in other surveys (Elliott and Ageton 1979; Gold 1970; Hindelang, Hirschi and Weis 1979; Short and Nye 1957).

Most of these questionnaires were concerned with documenting the incidence of delinquency in general, and the one or two items regarding property damage were then tallied as part of a more general index of antisocial actions. A few studies, however, have attempted to more carefully scrutinize vandalism as a specific behaviour, and have disaggregated the reported destruction into a list of specific actions such as "graffiti on school walls," "broke windows," "broken a bottle in the street," "damaged the tyres of a car," and various other acts (Beaulieu 1982; Gladstone 1978; Simpson and Hagan 1985). Results from a questionnaire administered to a stratified sample of British schoolboys aged 11 to 15 revealed that 85% of respondents reported having committed at least one of the twenty-four specific acts of intentional damage listed, during the previous 6-month period (Gladstone 1978). While the most common actions were less serious incidents, such as scratching on school desks and breaking bottles in the street, when it is recalled that any given city has thousands of youths in this age range, the cumulative effect

of these isolated incidents would result in an enormous amount of vandalism. Moreover, some frequently-reported behaviours are of a more serious nature, especially to property owners or managers faced with the consequences; 68% of respondents, for example, reported breaking windows.

In a more recent Canadian study of Toronto-area school children aged 9 to 19 years, even higher rates of involvement in vandalism were reported (Beaulieu 1982). Almost all students admitted committing one of the thirty items of vandalism about which they were questioned: 88.7% in the secondary schools, and 90.1% in the primary schools. Both the younger and older respondents reported less vandalism than those in their mid-teens, with a mean of 6.14 incidents reported by the nine-year olds and 7.10 incidents for those who were nineteen. The peak age for vandalism was in the 14-16 age group; these youths reported more than twice as much vandalism as their younger or older peers, with a mean of 15.94 incidents for fourteen-year-olds, 16.07 for fifteen-year-olds and 15.52 for those who were sixteen (Beaulieu 1982: 252-3). As in previous studies, most of these reported incidents were relatively minor in nature; but when viewed from the perspective of the cumulative number of incidents for all these respondents, let alone for the larger population of teenagers from which this sample was drawn, the effects are staggering.

What seems apparent from these studies, then, is that so many youths commit at least the occasional act of vandalism that "such acts as breaking a bottle in the street or a window in an empty house are so common as to be more or less normal behaviour" (Gladstone 1978: 23). The degree of seriousness of the behaviour, and the frequency with which it is committed, varies widely, with some more serious offenders reporting frequent involvement in a number of different types of destructive behaviour, while others report only a few. Nevertheless, the frequency with which vandalism is committed underscores the fact that vandals may be almost any youth, in some circumstances, and suggests that a consideration of those circumstances is warranted. In addition, the majority of these acts are acknowledged to be spontaneous. In the Toronto area study cited above, only 20% of the youths surveyed indicated that a specific target had been selected; the remaining 80% had not given any prior thought to what they were damaging, but had unpremeditatedly vandalized some structure that was conveniently at hand (Beaulieu 1982: 252).

The most likely circumstance for such impulsive behaviour is when young people are together in groups. In a large survey of American teenagers in a sample from both rural and urban settings, Erickson and Jensen found that 80% of the vandalism reported by their respondents had been committed in the company of peers (Beaulieu 1982; Erickson and Jensen 1977). The fact that almost all youths admit to committing at least occasional vandalism, and that they do so relatively

spontaneously and in the company of other young people, would suggest that wherever there are large numbers of youths, there will be higher levels of vandalism. Some support for this assumption is provided by a research project on the extent of crime in council housing estates in Great Britain.

Council housing is the equivalent to North American low-income or public housing. However, unlike the situation in North America where such housing is in extremely limited supply, so that only a relatively small percentage of the lowest-income residents qualify for it, there is a greater proportion of such housing in Great Britain; 30% of Britons reside in these housing projects (Hough and Mayhew 1980). Moreover, the estates vary widely in physical characteristics of design and density, in their proximity to the urban core of the city in which they are built, and in the social, economic and racial characteristics of their residents. A study of over 50 of these estates in the London area, however, revealed that in spite of their wide differences the most significant factor in predicting the amount of vandalism which occurred was child density, measured as the rate of children 6 to 16 years of age per dwelling unit (Wilson 1978: 49). While the study was undertaken in order to examine the relevance of design factors associated with the defensible space theory developed by Oscar Newman, which argues that natural surveillance and territorial definition of space can serve as a deterrent to crime (Newman 1973), considerations of design were overpowered by the concentrations of children. In a multiple regression analysis child density was the strongest predictor for vandalism on all estates ($r = .24$), out of all social and physical characteristics ($R = .43$) (Wilson 1978: 83).

While this research focused only on residential vandalism, much of which might well have been the incidental product of normal play, a second indication of the situational character of vandalism comes from an anti-graffiti campaign in Seattle, Washington (Bell, Bell and Godefroy 1988). This report summarizes a volunteer effort to combat urban graffiti in the downtown area by painting over each occurrence as soon as possible. Although this was a local, ad hoc initiative and its observations can be considered as primarily anecdotal in nature rather than empirically grounded, its finding that the most frequently recurring incidents of graffiti were around convenience stores and along the bus routes that served local schools is nevertheless intriguing, and suggests again that vandalism occurred during the course of routine, habitual activities.

Although some vandals may be active and aggressive youths who purposefully seek out specific property to destroy, as is believed by the public and portrayed by the media, many--perhaps the majority-- are ordinary youths who do their damage on impulse and with little thought about the costs or consequences. Much of vandalism is opportunistic in nature, and can be seen as a "phenomenon of

interaction" between offenders and the proximate environment; and this environment contains both physical characteristics and other persons who might either contribute to or restrain damage (Wise 1982). Expressed differently, it can be asserted that most vandalism arises from the convergence of offenders, suitable targets, and the absence of capable guardians, a statement which summarizes the key principles of routine activities theory (Felson and Cohen 1980).

THE SPATIAL DISTRIBUTION OF CRIME AND ROUTINE ACTIVITIES THEORY

All crime data consistently show a great deal of variation throughout different areas of a city (Bursik 1986; Gottfredson and Hirschi 1990; Reiss 1976; Sampson 1993). This is, perhaps, one of the best established and least disputed facts about crime, and it was the early observation of these spatial variations which initially contributed to the development of many of the classical perspectives on crime (Kornhauser 1978). The explanations for this phenomenon, however, have varied, and have been a source of controversy within the discipline. Early theorists equated areas of the city with neighbourhoods having enduring and distinctive features; and this conceptualization led to the development of theories which attempted to explain the criminogenic nature of these areas, and the criminal inclinations of their inhabitants (Bursik 1988; Park and Burgess 1933; Shaw and McKay 1942; Snodgrass, 1976). This attribution, in turn, led Robinson, in a 1950 article, to introduce a criticism that has become a key concept in sociology, one which serves as a methodological admonition in almost every introductory text: the ecological fallacy. This fallacy involves deriving conclusions about individual behaviour, based on aggregate data. There is no foundation for asserting that the high crime rates observed in a neighbourhood are the product of individual residents' criminality; some, if not all, of these crimes may be committed by outsiders who gravitate to these areas. Many residents of a high-crime area may be just as law-abiding as residents of other neighbourhoods. Yet crime may remain high, not because of the more criminal inclinations of residents but because of the enhanced opportunities presented by the convergence of potential offenders, suitable targets, and unguarded access.

Felson and Cohen assert that "the assumption that crime rates are completely wedded to rates of criminal inclination is theoretically disputable" (Felson and Cohen 1980: 397). Crime may vary, not so much because of differences in motivation, but because of variations in the opportunity structure which permits its occurrence. The circumstances under which crimes occur, from this perspective, are not random; rather they are functions of social and structural phenomena which

allow people to translate their criminal inclinations into action. Central among these circumstances is the question of opportunity.

The requisite components of opportunity are dictated by the social ecology of human activity, which in turn centres around daily tasks which people perform to meet their needs. These daily tasks are organized into rhythmic, ordered temporal patterns with a characteristic tempo. People get up and go to work or school; they may travel by various means such as cars or buses; during their leisure hours they may pursue certain hobbies or remain at home; they shop at preferred locations and times dictated by habit and convenience. Although these routines are essentially individualistic in nature, they may nevertheless display some consistent patterns at the aggregate level, derived from the resources, responsibilities, and expectations that arise from certain social roles.

The spatial and temporal structure of these routine activities, in turn, plays an important role in determining the location, type and quantity of crime that will occur in an area. Routine legitimate activities provide offenders with suitable targets, because those targets are both visible and accessible. Accessibility is increased by the absence of suitable guardianship, which is described as "supervision. . .which may prevent criminal violations from occurring" (Felson and Cohen 1980: 392)[3]. The nature and extent of guardianship is directly affected by whether or not people are at home or away from home, and whether there are many people about in an area during the day or at night. It is also affected by whether residents know the faces and activities of neighbours, and are capable of both recognizing and responding to events which appear out of the ordinary. Thus areas may vary because of differences in the *social characteristics of residents; social structural* factors; and *physical structures in the environment.*

Social characteristics of residents

Areas differ in their demographic composition, with some areas inhabited by a large proportion of young singles, others by retired persons, still others by young families. These characteristics will contribute to different patterns of normal activity, dictating whether the majority of residents are at home during the day, during the evenings, or only rarely; and whether residents come and go regularly or at all hours. Areas with a higher proportion of residents in their teens or early adulthood will normally have a greater amount of traffic and movement during the day and evening hours, as persons in these age groups go to and from school, work,

---

[3] Implicit in this definition of guardianship is that for it be effective, those who observe potential criminal events or crimes in progress must be both willing and able to intervene.

or other activities. In addition, people in these age groups may have more flexible schedules and more freedom to move about at will than either young children or older persons.

Residents in their teens or early adulthood can be expected to be absent from their homes more frequently. Similarly, the lesser domestic responsibilities of single persons makes it more likely that they will be involved in routine daily activities away from home. Single males might be expected to remain at home substantially less than any other demographic group (Hindelang, Gottfredson and Garofalo 1978). These circumstances suggest that in areas where a large proportion of residents are single males, guardianship would be substantially reduced. This may occur not only because these residents are often involved in activities away from their homes, and therefore unavailable to exert guardianship themselves, but also because as these residents pursue their daily routines they generate a greater amount of unscheduled activity and movement in the area. The lack of predictability inherent in this activity renders guardianship more difficult for other residents, who could be expected to have greater difficulty distinguishing between normal traffic and unusual events.

Social structural factors

At the same time, different areas are distinguished by more general structural factors; these include the proportion of unemployed persons, the amount of rental housing, the overall residential density and the extent to which there is frequent turnover in the population. High rates of unemployment mean that a larger proportion of the population of an area will not be involved in the customary routines imposed by a regular work schedule, and hence may be at or near home during larger proportions of the day. At the same time, unemployed persons may lack the resources required to engage in structured leisure activities, which again means that such residents are likely to remain in the vicinity of their neighbourhood for more frequent periods of time. Young males, both in their late teens and early twenties, are most at risk for both unemployment and higher involvement in crime; areas where both factors are present are likely to have a higher rate of criminal activity.

While some writers have suggested that these higher rates are related to the absence of legitimate pursuits and the attraction of the illegitimate alternatives provided by crime, this motivational imputation is not essential to explain the observed correlations between age structure, unemployment and crime in an area (Allan and Steffensmeier 1989). In keeping with a routine activities explanation, higher crime rates in these areas may be the result of enhanced opportunities arising from the convergence of potential offenders and reduced guardianship. When many

area residents are young males and there is a greater amount of movement and activity in an area at any hour of the day or night, it may be more difficult to distinguish between legitimate and illegitimate activities and between residents and strangers, thus reducing the ability of local residents to supervise and control what goes on (Sampson and Groves 1989).

A similar problem with supervision and control of activities arises in areas characterized by a high proportion of rental units, which may have a less permanent resident population than well-established owner-occupied housing tracts (Bursik 1988). In areas with a high population turnover, there is less likelihood that residents will know their neighbours and who does or does not have a legitimate reason for being in the area. Residents may be unable to exercise informal surveillance in direct observation of neighbourhood activities, and intervention through the questioning of strangers or suspicious activities (Sampson 1987). This sort of informal supervision is unlikely to develop where residents are not familiar with their neighbours, their neighbours' families, and other peoples' scheduled activities; thus crime rates may be higher. Although this type of neighbourhood surveillance has been linked with the concepts of social disorganization theory as the "capacity of a neighbourhood to regulate itself through . . . processes of social control," (Bursik 1988), it is not necessary to attribute these supervisory activities to levels of social organization or the lack thereof. Such a conception carries with it implicit assumptions about the greater propensities to criminal inclination that are inherent in the theory, and may be unfounded, since there is no way to determine that the residents themselves are any more or less inclined to crime. Rather, consistent with a routine activities perspective that emphasizes opportunity, higher crime rates in areas of high population turnover may be directly related to the inability of residents to exercise guardianship, combined with the convergence of potential offenders.

The population density of an area, by contrast, may have the opposite effect. Although high density could be argued to increase the convergence of potential offenders and suitable targets, and has been linked to a number of urban problems including higher crime rates (Hartnagel and Lee 1990; Webb 1972), the sheer number of people in an area may also make it more difficult for potential offenders to commit a crime without observation. In two studies examining the impact of public high school adjacency on crime in surrounding neighbourhoods, for example (discussed further below), density was predictive of lower rates of index, violent, and property crimes in both of the American cities studied (Roncek and LoBosco 1983; Roncek and Faggiani 1985). These findings are consistent with the assertion that density may increase guardianship and therefore deter crime.

Physical structures in the environment

Just as certain social structural characteristics may contribute to opportunities for crime in an area, certain physical structures may have a similar effect. Two types of public structures, shopping malls and high schools, have been identified by previous studies as being significantly related to higher crime rates in adjacent areas (Engstad 1980; Roncek and Faggiani 1985; Roncek and LoBosco 1983). Both serve to attract a large number of non-residents into an area who come and go with little formal supervision, which not only increases the likely convergence of potential offenders and suitable targets but also thwarts guardianship.

Shopping malls. Shopping malls exist for the express purpose of attracting potential customers to the shops and services they shelter. They routinely attract a large number of people into their locale on a daily basis, who come there for a variety of legitimate and illegitimate purposes. Malls are distinguished from shopping centres, in that the latter term usually refers to a group of stores which may share a common parking area but which often have separate entrances. When the term mall is used, on the other hand, its derivation from an older usage describing a promenade or sheltered walk usually suggests the existence of a covered common area which provides access to the stores and protection from the weather (Funk & Wagnalls 1987). These public areas, which are usually not under the supervision of individual proprietors, allow visitors freedom of movement and an opportunity to linger for extended periods of time; many malls provide seating and a number of food concessions for that specific purpose. For young people all over North America, malls make a convenient and attractive place to meet friends and socialize with little, if any, adult interference.

Young people in school are released in mid-afternoon when most adults are still at work; in addition, slightly older teens or young adults may no longer be in school, but may not be part of the work force. These circumstances mean that the population of likely offenders can gather at malls during hours when there are fewer legitimate patrons, resulting in reduced guardianship within the mall itself. During certain hours of the day and/or days of the week, the presence of legitimate shoppers may serve to increase guardianship within the mall itself, by making it more difficult for crimes to be accomplished unobserved. However, the informal surveillance which results does not extend to the surrounding neighbourhood. The large number of people who come and go in the streets around a mall works to reduce effective guardianship, since distinguishing between legitimate patrons and persons who are simply loitering may be difficult. It might be expected, then, that this combination of factors would result in higher crime rates in the areas immediately adjacent to malls, and at least one study supports this assertion. Engstad

(1980) found significantly higher frequencies of auto crimes, thefts, and miscellaneous offenses in three urban areas with shopping centres,[4] compared to surrounding areas with similar social and demographic characteristics. In the category of miscellaneous offenses, which included fraud, shopbreaking and mischief, areas with shopping centres were found to have between 2.1 to 6.5 times as many offenses as the average recorded for adjacent areas, and 1.5 to 3.7 times as many as the maximum recorded for these areas (Engstad 1980: 210-211). While it is not possible to disaggregate this offence category to evaluate the increase in any of these specific crimes, the results lend support to the assertion that the presence of a shopping centre in an area contributes to higher rates of crime.

High schools. Similarly, elevated crime rates were found in the areas immediately surrounding high schools in two studies conducted in medium-sized American cities (Roncek and LoBosco 1983; Roncek and Faggiani 1985). The first of these studies examined crimes occurring in a relatively new, affluent city which, according to the authors, ranks very low in crime in comparison to other American cities of similar size (Roncek and LoBosco 1983). In their analysis the authors report higher rates of several types of index crimes[5] in a one-block area immediately adjacent to public high schools, controlling for social, housing and demographic composition of the areas. Although the size of a school's enrollment was evaluated as a possible predictor, it was found to be nonsignificant. Similar effects were not found for private high schools. In discussing these results, Roncek and LoBosco speculate that ". . .the grounds of public high schools are public property and legitimately available for use by anyone while the grounds of private schools are not" (Roncek and LoBosco 1983).

In a replication of this study using the same variables, Roncek and Faggiani (1985) found comparable effects in a high-density, high-crime American city. Although the magnitude of the effect was different, reflecting the different social, racial and economic characteristics of the two cities, the presence of a public high school in an area was again found to predict more crime in the blocks immediately adjacent. Comparable effects were found for public high schools in general, regardless of the size of the school or the type of neighbourhood within which it was located (Roncek and LoBosco 1985:502).

---

[4] The distinction made above between malls and shopping centres notwithstanding, the cited study uses the latter term to describe the facilities discussed. To the writer's knowledge these facilities contain the type of common public area discussed as definitive of a mall. This usage reflects common practice for the City of Edmonton, where the study was conducted, and is discussed further in the chapter on Measurements and Method.

[5] Offence categories examined were murder, rape, assault, robbery, burglary, grand theft, and auto theft (Roncek and LoBosco 1983).

The geographic distribution of high schools, as the authors of these two studies observe, is not dependent on neighbourhood social characteristics. In other words, high schools are located both in affluent neighbourhoods and in poorer ones, and in areas with all types of racial and ethnic compositions. That the effect of high schools on crime in surrounding areas remains significant for public high schools in general, controlling for the social features of their environs, is consistent with a routine activities interpretation of varying crime rates. High schools are the focal point for the activities of a large number of people on a daily basis; and their public nature makes them an attractive setting for both legitimate and illegitimate leisure activities. Moreover, the discursive nature of the movement of students to and from classes and of other persons attending after-hours activities means that it is difficult to distinguish between visitors who have a valid reason for being in the area and those who do not, a circumstance which effectively negates informal surveillance as a means of guardianship. Increased crime rates in these areas, then, may be plausibly explained with reference to the convergence of potential offenders, who encounter suitable targets in conditions of reduced guardianship.

ROUTINE ACTIVITIES AND VANDALISM

While most crimes may require the convergence of motivated offenders, suitable targets, and the opportunity provided by inadequate guardianship, it is reasonable to suppose that the role played by these elements would be contingent on the specific type of crime. For some crimes, potential offenders may be highly motivated to seek a suitable target. Other crimes may involve a target which is itself restricted in distribution, so that a crime can only be expected where that target is present. In evaluating the role of these components for predicting vandalism, the availability of targets is presumed to be of negligible importance. The most common victims of vandalism are often public buildings or institutions such as schools, transit companies, phone companies, or parks and recreation departments whose structures are scattered throughout a city. Vandals can, and do, vandalize almost anything, from the shrubs and trees in parks to the walls and windows of downtown buildings (Geason and Wilson 1990; van Vliet 1992).

Of greater significance in the occurrence of vandalism, then, is the convergence of potential offenders in an area, and reduced guardianship. As discussed previously, a majority of young persons admit to committing vandalism. Moreover, they are most likely to commit the acts of destruction when they are together in groups. Although there is some variation in the peak age identified for potential offenders, there is a general consensus that the majority of vandalism is committed by those in the early to middle teens. Some research has also identified

children slightly younger, and young adults under the age of twenty-five, as being likely offenders. Consistent with these observations, it might be expected that any area which contains a large proportion of young residents would experience higher vandalism than other areas.

The previous literature has implicated young males as being most widely involved in vandalism, and hence the proportion of young males in an area is viewed as particularly relevant. At the same time, however, there is some controversy about female involvement in more general delinquency. While acknowledging that females commit less crime overall than males, a number of writers in recent years have asserted that younger females are closing this gender gap, and that they are likely to commit very minor, property-related offenses that do not show up in official statistics (Chapman 1980; Figueira-McDonough et al., 1980; Smith and Visher 1980). Given the fact that vandalism is such an offence, and noting also that the previous literature which examined vandalism from a situational perspective did not distinguish on the basis of gender (Bell, Bell and Godefroy 1988; Wilson 1978), the proportion of females in their teen years may also be relevant, and is evaluated in the present study.

In addition, a number of factors in the residential environment have been discussed as predictive of higher crime rates in general, and may hinder effective guardianship by limiting the amount of informal surveillance and supervision in a given area. Areas which contain many unemployed persons, more single males, more rental than owned housing, and a larger number of transient residents will have greater movement and activity in and around the neighbourhood, both during the course of the daily routine and over longer periods of time. These factors, in turn, make it more difficult to distinguish between legitimate and illegitimate activities, and between strangers and residents, so that guardianship is weakened. These areas, therefore, may experience greater amounts of vandalism. Areas of high density, on the other hand, may not afford the anonymous access to unguarded targets which is deemed to be necessary for vandalism to occur. Potential offenders may feel constrained by the possibility of observation, so that less vandalism may occur in such areas.

Finally, the presence of malls and secondary schools within an area has been linked to higher levels of crime. While these public facilities render guardianship difficult, as discussed above, they may be particularly significant in the occurrence of vandalism because of their focal role in the routine activities of young people. Since school enrollment is mandatory until the age of sixteen, and vandalism has been linked with persons in their teens, many of those who can be considered potential offenders will attend school at least sporadically. While the previous literature cited above examined only high schools as providing environmental

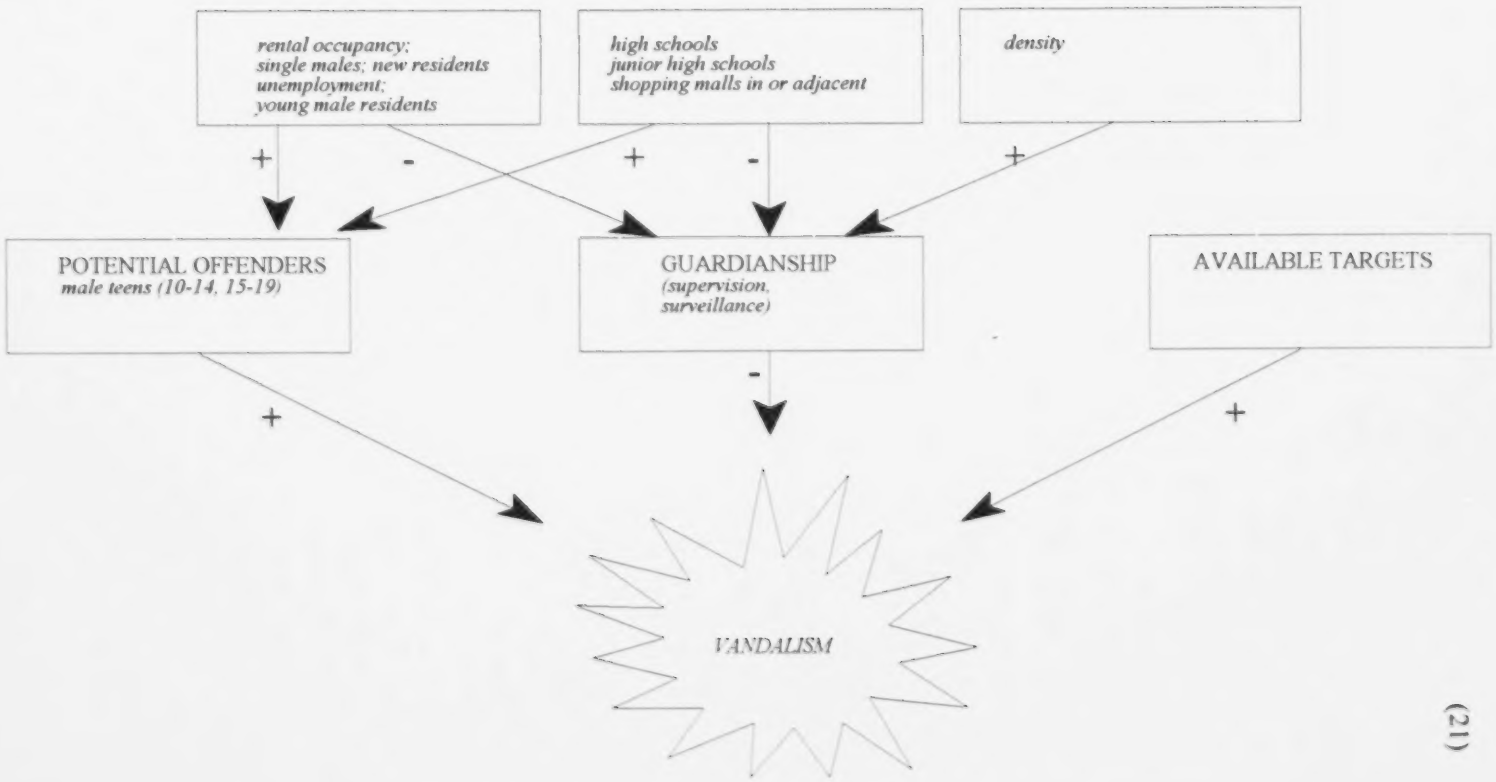
opportunities for crime, vandalism has been linked to teens younger than high school age, and therefore junior high schools are included in the present study. Lastly, malls serve to impede effective guardianship because of the regular influx of both legitimate and illegitimate visitors on their premises; and they are a popular meeting place for young people. The presence of a mall in an area is therefore expected to contribute to higher levels of vandalism.

Model for predicting vandalism from routine activities theory

The predicted relationships between these factors and vandalism is summarized in *Figure 1*. As this model suggests, an increase in the number of potential offenders, combined with the presence of available targets and a decrease in guardianship, are predicted to result in higher levels of vandalism. Certain residential factors are predicted to contribute to the presence of potential offenders, and also to reduce effective guardianship. Among the residential characteristics identified are high rental occupancy, the number of single males and young male residents, the amount of unemployment, and the number of residents who are new to the area. Shopping malls and secondary schools in the vicinity are also expected to contribute to the convergence of potential offenders, and to inhibit guardianship. Some residential factors, however, particularly density, are expected to *increase* guardianship.

FIGURE 1

PROPOSED MODEL PREDICTING VANDALISM
According to Routine Activities Theory



HYPOTHESES

In keeping with these assertions, the following specific hypotheses will be used as the basis for evaluating the relationships between the predictor variables and vandalism:

H1: Vandalism will be higher in areas with a larger proportion of male teenagers;

H2: Vandalism will be higher in areas where a larger proportion of residents are unemployed, where a larger proportion are single males, where there is more rental housing, and where more residents are relatively new to the area; and lower in areas of high density;

H3: Vandalism will be higher in areas which contain a public junior or senior high school; and

H4: Vandalism will be higher in areas which contain or are adjacent to a shopping mall.

UNDERSTANDING THE BEHAVIOUR: THE ISSUE OF CAUSATION

Support for the above hypotheses in the empirical study which follows would lend some credence to the utility of a routine activities approach to vandalism. The question remains, however, as to whether such a perspective contributes anything to an understanding of the behaviour. Is it of any theoretical interest, or is it simply an "atheoretical exercise in the mapping of criminal phenomena" ? (Bursik 1986: 36) Are areas with higher levels of crime merely hosts to these events, which would inevitably have occurred somewhere, or are these areas criminogenic in themselves: do they contribute to crime by shaping or even generating the behaviour? (Sherman, Gartin and Buerger 1989: 46) These questions cannot be answered by a study such as this one, but speculation is possible. According to the routine activities perspective developed by Felson and Cohen, situational factors may indeed contribute to the occurrence of crimes; by permitting them to occur and reducing the likelihood of apprehension, such factors can be viewed as proximate sources of causation (Felson and Cohen 1980). Vandalism, in particular, has been described above as being influenced by immediate situational factors. Even where a

predisposition to offend exists, vandalism might not occur without the convergence of favourable circumstances (Clarke 1978: 6).

Yet the assertion that behaviour may actually be formed by the circumstances surrounding it has itself been the object of severe criticism. That human behaviour can be generated by its surroundings has been described as mechanistic, at best, and environmental determinism at worst (Clarke 1978). However, the view that criminal events are contingent on the situation is derived from a rational conception of behaviour which attributes actions, including criminal actions, to a calculation of costs and benefits. From this perspective, benefits are enhanced by the relatively low risk of apprehension which is inherent in some circumstances; thus the perception of opportunity may in fact contribute to the occurrence of a crime such as vandalism. Risks, on the other hand, particularly the risks of being caught which are implied in the concept of effective guardianship, may do more than simply divert the behaviour; the perception of risks involved may act to suppress the behaviour. These issues are discussed further in Chapter 5.

CHAPTER 3

MEASUREMENTS AND METHOD

DEPENDENT VARIABLE

In order to test the hypotheses derived from routine activities theory discussed in the previous chapter, reports on the incidence of vandalism in the City of Edmonton were obtained from two city departments, the Department of Parks and Recreation and the Transit Department, and from the Edmonton Police Service. The two departments each separately recorded vandalism which occurred to the facilities under their jurisdiction, while the police department provided records on all reported incidents of mischief over or under $1000. Although the original intention of this study had been to merge the data from these separate sources in order to obtain a composite index of vandalism, this was not feasible because of the different nature of the targets, the types of incidents which could occur, and the way in which they were recorded. Each of the three types of measures is discussed in detail below.

Mischief incidents

The data file obtained from Edmonton Police Service contained the records for all mischief incidents in 1992. Mischief, as previously noted, is the statutory category under which most incidents of vandalism are recorded in Canada. Although this offence category refers to wilful, malicious damage, and most incidents recorded by police may reasonably be viewed as vandalism,[6] a potentially critical issue with respect to the present study is whether the reports contained in police records are reflective of the real incidence of vandalism. Police records do not provide a count of the actual number of crimes which have occurred; they count, instead, those for which police have filed a report. Criminal events are processed through what has been described as a funnel consisting of various stages, each of which inevitably results in a loss of numbers (Silverman, Teevan, and Sacco 1991:

---

[6] Section 430.1 of the Canadian Criminal Code states that ". . . Everyone commits mischief who wilfully (a) destroys or damages property; (b) renders property dangerous, useless, inoperative or ineffective; (c) obstructs, interrupts or interferes with the lawful use, enjoyment or operation of property. . . ," and actions of this nature could reasonably be viewed as vandalism. However, Section 430.1.1 adds that anyone who "destroys or alters data,""renders data meaningless, useless, or ineffective" or otherwise interferes with data is also guilty of mischief (CCC 1990: 210-211). Actions falling within the latter subsection would not be considered vandalism. It is, unfortunately, impossible to determine from the data source used in this analysis if the police records on mischief incidents include offenses of this nature, and if so how many.

56). Prior to their being recorded as crimes, incidents must first be detected; a report or complaint on the incident must be made; and police must respond. Vandalism is a highly visible offence, and therefore may be observed by a potential complainant. There is reason to believe, however, that a great deal (if not most) vandalism will not be reported to police. Even if reported, police may not respond, or may not file a report. Thus, the two most critical processes which might affect whether or not police statistics reflect the actual extent of vandalism are *underreporting* and *differential police response*.

Underreporting. Most criminal activity of any type comes to the attention of police because of citizen complaints (Nettler 1984: 49). Although for some more serious offenses reporting is relatively high, so that police reports more closely reflect the actual incidence, for less serious offenses reporting can be extremely low. Since vandalism is a minor offence, and there is little likelihood that offenders will be caught, it might be expected that vandalism would be severely underreported. In a study conducted in Great Britain, for example, vandalism was assessed by observation and by consultation with residential managers. These figures were then compared to police activity. The author of this study concluded that less than 10% of vandalism incidents were recorded as crimes (Clarke 1978: 18). The majority of incidents were too minor to report. Those who suffered the damages were more interested in getting repairs completed than in initiating a criminal investigation, particularly one from which they expected little in the way of results.

In Canadian cities, too, the minor nature of the offence and the expectation of little gain from police investigation mean that vandalism is likely to be underreported. In the Canadian victimization surveys, the majority of respondents who reported being vandalized indicated that they had failed to report the damage. Approximately 75% of this failure to report was attributed to the fact that respondents saw "no benefit" in formal police action (Canadian UVS 1983: 5). These surveys reveal that more Canadians had reported vandalism than suggested by the British study cited above. Overall, 35% of incidents had been reported, with a slightly higher figure of 39% for the City of Edmonton (Canadian UVS 1983). Nevertheless, even these higher figures mean that most vandalism incidents do not show up in official police records.

Differences in police activity. Even where incidents result in a complaint to the police, police may or may not respond; and when they do respond, they may or may not file a report. Police response to citizen complaints may be dictated by policy, by the seriousness of the crime, by immediate workloads, by perception of the neighbourhood from which the report comes and a host of other unmeasurable variables (Silverman, Teevan and Sacco 1991: 57). If police response occurs, a report may not be filed if police are uncertain about the deliberateness of the damage

(Clarke 1978: 18).

The extent to which vandalism is "underreported" by citizens and police would not be a serious threat to the validity of police statistics on incidence if these processes were relatively constant in different areas of the City. If citizen or police response varied by area, however, police reports might present a distorted picture of actual incidence; and some writers have asserted that this is indeed the case. Hagan, Gillis and Chan (1978: 387), for example, argue that statistics on crime are significantly shaped by police activity. Any area which receives a great deal of police attention will accordingly be perceived to experience more crime. These authors conclude that crimes are more likely to be reported and officially responded to by police in lower-class areas of a city, thereby inflating official statistics for these areas in comparison to middle- and upper-class neighbourhoods. Similarly, Chambliss and Nagasawa argue that police statistics on general delinquency "diverge substantially" from what actually occurs, so that official figures indicate police activity rather than patterns of crime (Chambliss and Nagasawa 1969).

In spite of the potential for distortion from underreporting and differential policing inherent in official measures of criminal activity, however, there are a number of reasons why the police data on mischief incidents are incorporated in the present study. For one thing, any attempt to determine the extent of crime is subject to some flaws which arise from the way in which the data is gathered and measured. Nettler asserts that "[n]o presently employed measure of criminal activity, official or unofficial, is sensitive to the full range of crime. . . ." (Nettler 1984: 49). Thus, the acknowledged limitations of police records does not mean that they should be ignored; other sources of data are also limited. In addition, the police data on mischief incidents represented by far the largest set of data of the three sources to which the writer had access. With over 13,000 incidents, there were ten times as many incidents recorded by the police as were reported by Edmonton Transit, whose records comprised the second-largest set. This volume, in turn, reflects the fact that police records included damage to all types of targets, including private homes, churches, industrial sites and businesses, which might otherwise have been unavailable. The number of cases recorded also reflects the fact that the police records involve, in general, single incidents rather than multiple ones. By contrast, records from the other two source agencies include an unknown amount of cumulative damage, resulting from the way in which the data were gathered.

More importantly, while underreporting and differential police activity have been accused of contributing to inflated amounts of some types of crime in high-density, lower socioeconomic areas, they may have the opposite effect for official records of vandalism. It seems likely that residents in well-kept, owner-occupied homes would report incidents of damage more often than those in high-rental areas

which are already run-down. The same reasoning might be applied to agencies and businesses: those in better-maintained areas would be more inclined to contact police about incidents of damage than those in less prosperous, previously vandalized areas. In responding to such complaints, police would presumably be more likely to file a report on vandalism to an otherwise well-maintained and intact structure than they would on damage to one which is already in a state of disrepair. Moreover, police in relatively low-crime areas might have more time to devote to such minor offenses than those in high-crime areas who are preoccupied with more serious crimes. While there is no way to verify the accuracy of these statements, if valid they would result in over-reporting of mischief in areas which are otherwise viewed as low-crime neighbourhoods rather than the converse.

The extent to which police data on mischief incidents does or does not reflect the actual occurrence of vandalism, then, remains an open question. Within the context of the present study, the availability of two other measures of vandalism permits comparison of the results, thereby providing an opportunity to evaluate the similarity of patterns of incidence. Since information obtained from the other two contributing agencies consists of maintenance records to damaged structures, the difficulties associated with underreporting and selective recording of damage are avoided. Where damage was observed and repairs were required, maintenance personnel for each City department were required to file a report, in which they indicated their judgment as to whether the damage was caused by accident, normal wear-and-tear, theft, or vandalism. The sources for measurement error for both of these departments, then, are the accuracy of these assessments and the counting of incidents.

Transit vandalism

The records obtained from the City of Edmonton's Transit Department reported damage to bus stops and shelters throughout the City. These records were compiled on the basis of reports from staff maintenance personnel, who made regular visits to each shelter. Given the nature of these structures, it can be assumed that assessments on the *type* of damage would have a high degree of accuracy: there is little to steal, and the rugged and austere construction used would resist most inadvertent damage. The majority of these incidents involved damage to the glass or plexiglass panels from which shelters are constructed; graffiti is excluded from the reports.[7] However, maintenance personnel only visit the shelters on their route

---

[7] Although the transit department also keeps records on damage to buses and LRT trains, these records are of necessity excluded from the current study, since they cannot be spatially located as occurring in any one area.

on a monthly basis. Any vandalism which is recorded at that time may therefore incorporate an unknown number of actual incidents (Kowalchuk 1993).

Parks and recreation vandalism

Reports on vandalism recorded by the Department of Parks and Recreation also derive from periodic visits by maintenance personnel. Unlike the Transit Department records, however, which list only a relatively restricted type of damage to specific types of structures, records from the Department of Parks include a variety of different incidents, reflecting the greater variation in the types of structures and grounds for which this department has responsibility. In addition to all parks within the municipal limits, the Department of Parks and Recreation maintains recreational facilities, cemeteries, the grounds of public buildings, ravines and tracts of public landscaping such as the medians and borders of roads. Hence, there are many different types of damage which might occur to lawns, flowerbeds, buildings, pools, and other structures. This greater variety renders the issue of determining the exact nature of the damage, and judging whether or not it is vandalism, more problematic. Although personnel attempted to discriminate between accidental and deliberate damage, and between damage which occurred as the byproduct of some other activity and gratuitous damage (vandalism), it is unknown to what extent this discriminatory process was successful. In addition, there is no way to ascertain whether similar criteria were used in evaluating incidents in different locations. These distinctions were made at the unit level by individual maintenance personnel, who filed a report on damage and classified it according to type of incident (Gorman 1993).

Measurement of vandalism by area

Incidents of vandalism from all three sources were geocoded by a computerized mapping program that assigns the x,y coordinates for spatial data to a reference map; in this case, a street map of the City of Edmonton was used.[8] The number of incidents from each source was separately aggregated using the boundaries defined for the City's 1992 municipal census to provide a total figure for the three types of vandalism in each area. The actual number of areas included for analysis differed for each of the measures of vandalism, and was contingent upon the presumed existence of potentially-damaged structures. Since mischief could be directed towards any building, facility, or structure in the City, including private

---

[8] A detailed discussion of the technique of geocoding, and its application in the present study, is contained in Appendix A.

homes and industrial sites, all 662 areas of the City were deemed to contain potential targets, and hence all of these areas were included in the analysis. Transit vandalism, by contrast, had been recorded as it occurred to transit shelters and stops; the areas where it could occur, therefore, were of necessity limited to areas serviced by bus routes. Eliminating those areas of the City which could not be subject to transit vandalism because of the absence of bus routes (the sparsely settled areas on the perimeter of the City) reduced the number of usable cases to 631 areas. Parks and recreation vandalism, too, could only be assessed with reference to areas which contained parks or other appropriate targets; elimination of industrial areas and several areas in the downtown core reduced the number of areas used in the analysis of park vandalism to 617 cases.

These steps resulted in figures for the *actual count* of vandalism incidents recorded in each area of the City by police, transit officials, and the department of parks and recreation. While the use of census enumeration areas as the unit of analysis is discussed in greater detail below, their variations both in population and in size are significant in relation to the measurement of the dependent variable of vandalism. In resident population, these areas range from 0 (for six areas of the City) to 3201 for the most densely populated; in size they range from .027 square kilometres to over 55. These two factors are inversely related, so that the largest areas are low in population, while the small areas are high.

The question arises, then, as to how to interpret and analyze the frequency of vandalism incidents. The amount of crime that occurs in a given area is most often calculated as a rate, obtained by dividing the total number of crimes by the total population and then multiplying by a constant (usually 100,000) (Nettler 1984: 47; Silverman, Teevan and Sacco 1991: 61). Such a population-based rate is useful for comparing many types of crime, since it is plausible to assume that a larger population would contain a larger number of offenders, even if the *proportion* of such offenders within the population remained constant.

For the present analysis, however, there are a number of shortcomings involved in using a population-based rate, related to the unit of analysis and the statistical methodology used. While it is logical to calculate a population-based rate of crime for larger geographical units such as a city in comparison to other cities, because most of the crime in a city may logically be attributed to residents, it is much less reasonable to make the same assumption about smaller geographic units such as enumeration areas. While it may be true that offenders are likely to select targets close to their own residences (Reiss 1976), the question remains of *how* close. Five blocks might be considered "close," yet in a city such as Edmonton, this is a sufficient distance to place a criminal event two enumeration areas away from the offender's home territory. Following a similar argument, Harries asserts in a

1993 paper that criminal events may not relate to the residences of offenders even marginally; "most if not all the incidents may be attributable to outsiders. . . .[t]heoretically, zero events might be 'blamed' on residents, again making nonsense of the rate concept" (Harries 1993: 4). The merit of this argument may be seen by the fact that crimes can, and do, occur in areas where there is little or no residential population. In the present study, for example, some downtown areas, with few residents, recorded a substantial amount of vandalism, as did three industrial areas of the city which had no residents. The use of a population-based rate would inflate the amount of vandalism for the former areas, and would remove the latter from the analysis, since it would entail the use of zero as a denominator.

Moreover, it has been previously argued that the *proportion* of area residents who fall into certain age, gender, and social categories will have an impact on the amount of vandalism observed in an area. Computing proportions of this nature involves using a population-based figure as the denominator for these predictor variables. However, when both independent and dependent variables in a multiple regression analysis are computed as rates using the same figure in the denominator, a spurious positive relationship results because of the common term (Bollen and Ward 1980: 61).

Similar difficulties arise in relation to the physical size of an area. Vandalism is a crime, not against individual victims, but against the physical environment. Moreover, while it is often directed against the structures in populated areas such as residences and stores, damage can also occur in parks and ravines as vandals break branches, scratch their names in bark or uproot ground cover, and in industrial or commercial areas. It could therefore be argued that a rate of vandalism based upon some areal unit such as square kilometres would provide a better measure, since larger areas would presumably provide more opportunities for crime. A rate of crimes-per-square-kilometres seems more satisfactory than one based on population, since this areal rate presumes to address the issue of environmental opportunities; yet it is not entirely adequate either. The opportunities inherent in available targets, by themselves, are not sufficient to predict vandalism according to the theoretical perspective developed in the previous chapter. Rather, it is the convergence of potential offenders with these targets in the absence of suitable guardianship which provides the conditions under which vandalism can occur. These factors, in turn, were linked to the routine movements of human activity in time and space. It seems apparent, then, that not all locations are the same in terms of the opportunities they provide. While the empty land around the City's perimeter may theoretically be vandalized, areas which contain a number of residents of all ages, or a mall, or a school, would likely experience a greater convergence of all of

the components contributing to the occurrence of crime, and therefore might be expected to offer more immediate opportunities.

These arguments suggest that both the physical size of an area and the number of persons who live there are important considerations; neither one alone provides an adequate basis for constructing a rate to control for their effects. For this reason, the *actual counts* of the three types of incidents which occur within each area are retained as measures of vandalism. To control for the effects of area size and population, these measures are introduced as independent variables in the multiple regression analysis summarized in the following chapter (Bollen and Ward 1980: 72).

CENSUS ENUMERATION AREAS

Census enumeration areas are subdivisions of the permanent statistical areas established by Statistics Canada. The boundaries chosen are intended to define an area as homogenous as possible in terms of socioeconomic characteristics and to follow, where feasible, well-established natural boundaries (Lalu 1989: 1). Although the City of Edmonton's Municipal Enumeration does not provide as much demographic detail as the Census itself, the enumeration areas are smaller, permitting greater refinement in terms of geographic variation of characteristic. These smaller areas serve as the unit of analysis in the present study. Their primary disadvantages are that they vary in both size and total population and that they are not equivalent to actual neighbourhoods in any meaningful sense.

In order to address their variability, both size in geographic units and the total population of an area are introduced as control variables. Moreover, most population characteristics are standardized as a proportion, using either the total population of the area (or for some variables the total number of housing units) as the denominator. That these areas do not correspond to meaningful neighbourhoods, however, is potentially more problematic. The routine activities perspective which forms the theoretical basis for this research does not equate the concept of neighbourhood with that of community, and the distinctive sociocultural attributes inherent in this term as developed in the earlier ecological tradition. Nevertheless, some minimal assumption about "neighbourhood" is implicit in the expectation that people can potentially come to know their neighbours, that they may become familiar with their neighbours' children and habitual routines, and that these developments are important in informal guardianship. These processes might well transcend the arbitrary boundaries of the enumeration areas. While this may indeed be the case in some areas, however, the placing of boundaries along naturally-occurring lines of demarcation such as main roadways, parks, ravines and

commercial strips would tend to create effective barriers. Residents preoccupied with their own daily activities are less likely to take note of events which occur across the park, or across the railroad tracks, than they are of those in their immediate vicinity.

Age and gender. A final point regarding the residential characteristics of areas used as predictors of vandalism in the present research arises with respect to the measurement of age and gender of residents. A previous study on the incidence of vandalism in housing estates (discussed above) found that child density, measured as the number of children 6-16 per residential housing block, was the single most significant predictor of levels of vandalism (Wilson 1978). Such a general child-density measure does not permit any distinction on the basis of different ages; nor does it permit distinction on the basis of gender. Yet both of these are viewed as potentially significant. For the present study, then, the proportions of area residents who are in several age/gender specific categories are included as predictor variables, rather than a single measure of child density.

The population composition of areas obtained from the Census data file reported age by sex in 5-year categories. Since previous self-report literature on vandalism suggested a peak age for potential offenders of approximately 14 to 16, with declining but still substantial involvement for age ranges on either side, the age categories of 10-14 and of 15-19 are used in this study. Although vandalism has been widely attributed to males, with boys outnumbering girls by a ratio of 9:1 according to several sources, other researchers have suggested that female deviance, particularly among younger females and for less serious offenses, is increasing. Given that the data used in this analysis is relatively recent (1992), the possibility of female involvement is acknowledged, and both males and females in these two age groups are included as possible predictors of vandalism. Finally, while vandalism is most often attributed to teenagers, several sources have reported that males between 18 and 25 comprise the second-largest group of *apprehended* offenders. Hence, the corresponding category of males 20-24 is also included.

Environmental structures

Major shopping malls and secondary schools comprise the final group of variables included as predictors of vandalism in this study.

Malls, as discussed in the previous chapter, are at least potentially distinguished from shopping centres by the fact that the former contain a sheltered public area. This architectural feature is viewed as significant in providing an attractive venue for potential offenders to converge, particularly in light of Edmonton's climate. In common usage, however, the City of Edmonton does not

distinguish between these types of facilities. Some major centres, which to the writer's knowledge are properly termed malls, are listed as shopping centres; while other facilities are designated as malls although the only areas common to all shops is a parking lot. Hence, the facilities included in this study were the larger, well-established shopping malls. A number of others, including several smaller neighbourhood centres, were excluded, although these sites may indeed be malls which are popular hang-out areas for local teens. The size of the facilities included, both in terms of the amount of traffic they might generate and the amount of land they occupied within a given area, suggested that their impact as predictors of vandalism might extend beyond the geographic confines of the enumeration area within which they are located. Hence, malls are included as a predictor where they occur within an area, and also if a major mall is located in the immediately adjacent area.

Secondary schools include four types of schools: the junior and senior high schools of the public school district, and the junior and senior high schools of the separate school district. Several schools in the separate school district serve students at more than one level, including three junior/senior high schools; these schools were treated as high schools in the analysis, based on the assumption that the older group of students would have a greater impact on the school's environment than the younger. Because previous research on the effect of schools on crime in surrounding areas (Roncek and LoBosco 1983; Roncek and Faggiani 1985) had identified a single-block radius as the extent of significant differences, these structures were introduced as variables only within the enumeration area in which they were located.

Each of these facilities was coded as a dummy variable in the analysis of vandalism reported in the following chapter. The presence of a mall within an area was represented by a value of 1, as was the presence of a mall in an adjacent area, the presence of a public junior or senior high school, or a separate junior or senior high school. For areas where any of these were absent, a zero was entered for that variable.

CHAPTER 4

DATA AND RESULTS

DESCRIPTIVE STATISTICS

The City

Edmonton, Alberta had 618,195 residents within its metropolitan limits during 1992, the year in which data for this study was gathered. The total area occupied by the City was 691.29 square kilometres,[9] with an average population density of 3,478 residents per square kilometre. Environmental features of the city included thirteen senior high schools and twenty-six junior high schools in the public school district, and nine high schools and eleven junior highs in the Separate school district.[10] There were, in addition, seventeen shopping malls.

As reported in *Table 1*, which gives the means, standard deviations, minimums, maximums and sums for the variables included in the analysis, the City's 662 enumeration areas varied in size from .027 to 55.027 square kilometres; mean size was 1.044 square kilometres. Population in these areas ranged from 0 (for six areas) to 3201, with a mean population of 934. Considering the age and gender groups of interest in this research, 19,775 residents were males between the ages of 10 and 14 (2.9% of the population); 19,183 were males between 15 and 19 (3%); and 27,333 were males between 20 and 24 (4.7%). In addition, 18,430 residents were females between 10 and 14 years of age (2.7%), and 19,341 were females between 15 and 19 (3%). Forty-five percent of City residents had lived at their current address for less than one year. Slightly less than half of households (44%) were rental units, and approximately 7% of residents were unemployed.[11] Single males made up 24.9% of the population.

---

[9]The dimensions of the City are those calculated by summing the area per square kilometre for all enumeration areas defined by the Municipal Census (1992) , using mapping software. The size may vary from that reported by other sources.

[10]A complete list of schools and their addresses is contained in Apprendix C. Appendix D lists the malls which were included.

[11]This figure is somewhat lower than that reported by other sources. The variations may be attributable to the way in which the data used in this analysis was gathered, or it may reflect differences in measurement.

TABLE 1

DESCRIPTIVE STATISTICS
Means, Standard deviations, minimums and maximums for variables by Census enumeration Areas[a]

Variable	*Mean*	*SD*	*Min.*	*Max.*	*Sum*	*Valid N*	*Variable Label*
AREASQKM	1.044	4.318	0.027	55.027	691.292	662	*Area/square km.*
SUMPOP	933.829	358.360	0.000	3201.000	618195.000	662	*Total population*
POPDEN	3477.540	2933.824	0.000	27284.170	.....	662	*Population density*
PFEM1[b]	0.027	0.015	0.000	0.065	18430.000	662	*Proportion female 10-14*
PFEM2[b]	0.030	0.012	0.000	0.123	19341.000	662	*Proportion female 15-19*
PMALE1[b]	0.029	0.024	0.000	0.494	19775.000	662	*Proportion male 10-14*
PMALE2[b]	0.030	0.016	0.000	0.295	19183.000	662	*Proportion male 15-19*
PMALE3[b]	0.047	0.026	0.000	0.222	27333.000	662	*Proportion male 20-24*
PNEWPOP	0.451	0.182	0.000	0.992	.....	662	*Proportion 1 yr./pres. address*
PRENT	0.439	0.290	0.000	1.000	.....	662	*Proportion rental occupied*
PSINGM	0.249	0.064	0.000	0.670	.....	662	*Proportion single male*
PUNEM	0.074	0.064	0.000	0.667	.....	662	*Proportion unemployed*
MISC	19.835	18.194	0.000	260.000	13131.000	662	*Mischief incidents[d] (count)*
TRANV	2.090	2.999	0.000	24.000	1319.000	631	*Transit vandalism[e] (count)*
PARV	0.637	2.498	0.000	29.000	393.000	617	*Park vandalism[f] (count)*

[a]Source: City of Edmonton Municipal Census (1992) unless otherwise indicated.
[b]Represented as proportion unless otherwise indicated.
[c]Sum represents total population in age category.
[d]Source: Edmonton Police Service Research Department.
[e]Source: Edmonton Transit.
[f]Source: Edmonton Parks and Recreation.

Vandalism

Mischief. A total of 13,131 mischief incidents had been successfully geocoded and were used in the analysis. These cases represented 97% of the original 13,537 records obtained from the Edmonton City Police. When these incidents were aggregated by area, the number of incidents ranged from 0 to a maximum of 260 for a single area; the mean number of incidents was slightly less than 20.

Mapping of mischief incidents revealed a marked concentration in a small number of areas, as may be observed in *Figure 2* (following page). A half-dozen areas of the City had over 90 incidents each during the year. Two of the highest-ranking areas, represented as black rectangles on the map, were located slightly north of the City centre; each of these areas had over 105 incidents. The varying intensity of shading in this central region, with darker colours indicating more incidents and lighter less, suggests that there is a general clustering of higher-incidence areas in the central core of the City, extending out to the north and the east. Lower levels of incidence occurred in the residential areas at the City's periphery. A second region of more concentrated incidence was recorded in the southeast quadrant of the City, where several areas had a total of 60 or more incidents. In a third region of concentration, on the west side of the City, another black area is apparent, representing again the highest level of incidence. This particular area proved to be noteworthy; with 260 incidents of mischief, it had 105 more recorded incidents than the next-highest ranking area, which had 155. This area was viewed as an extreme outlier, and was excluded from the subsequent statistical analysis.

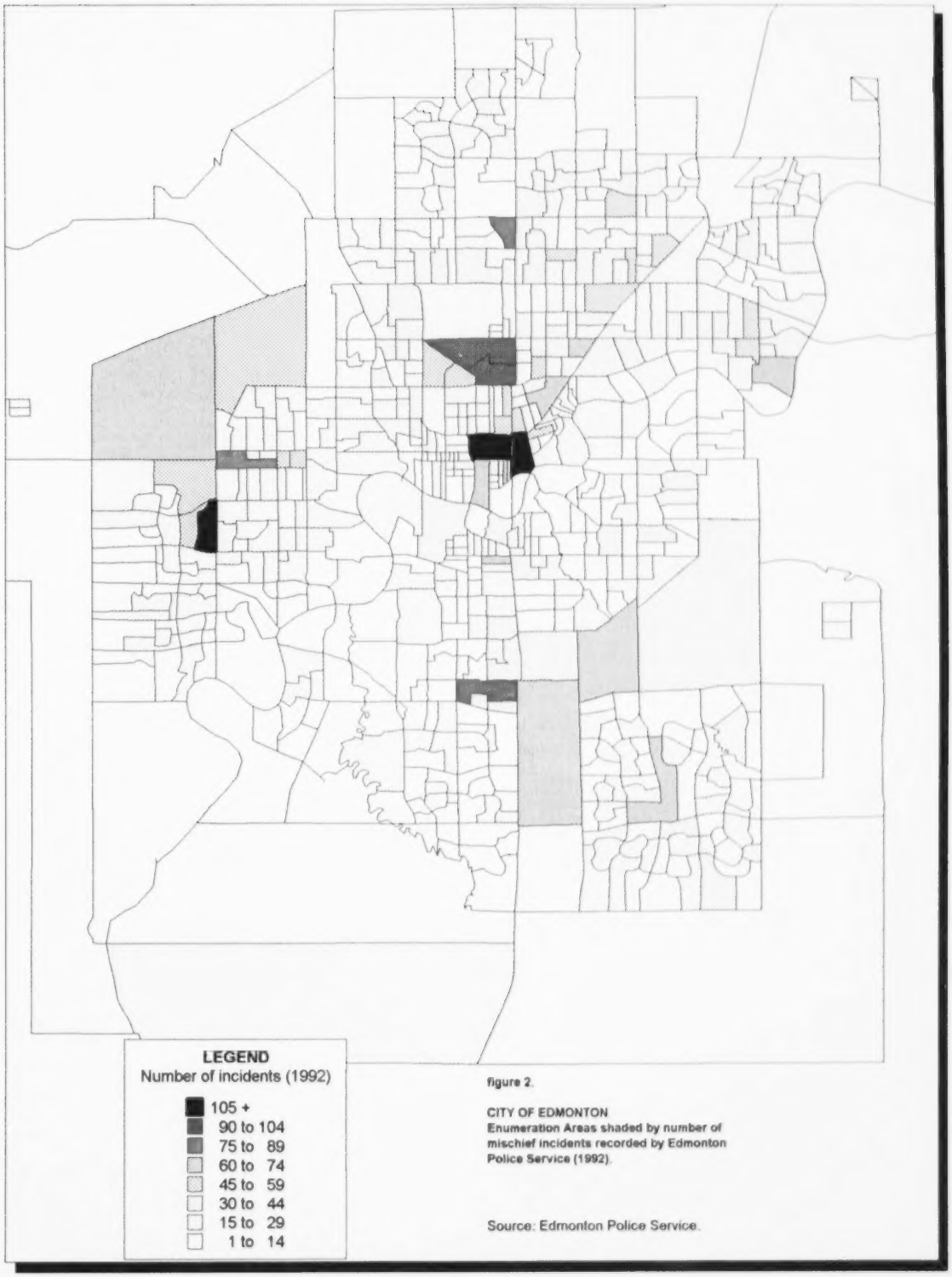


figure 2.

CITY OF EDMONTON
Enumeration Areas shaded by number of mischief incidents recorded by Edmonton Police Service (1992).

Source: Edmonton Police Service.

Transit vandalism. The Transit Department had recorded 1,337 incidents of vandalism to shelters and bus stops throughout the City during 1992. Geocoding successfully identified 98.6% of the locations, resulting in 1,319 usable cases. A mean of about two incidents per area was recorded, with a maximum of 24 (*Table 1)*. The distribution of transit vandalism is graphically summarized in *Figure 3*, where the areas which recorded a higher number of incidents are again shaded darker, while those with fewer are shaded lighter. Two areas, one north of the downtown area and a second one in the northeast quadrant of the City, are shaded black, indicating the highest count of incidents (20 to 24 per area). An additional five areas are included in the next two ranges, indicating that they recorded between 16 and 21 incidents per area. As with mischief, there is some apparent clustering of high-incidence areas around the central area of the City map, with some dispersion out to the north and east. On the south side, a single area stands out; 20 incidents of transit vandalism had been reported as occurring in this non-residential area, making it the third-highest ranking in the City.

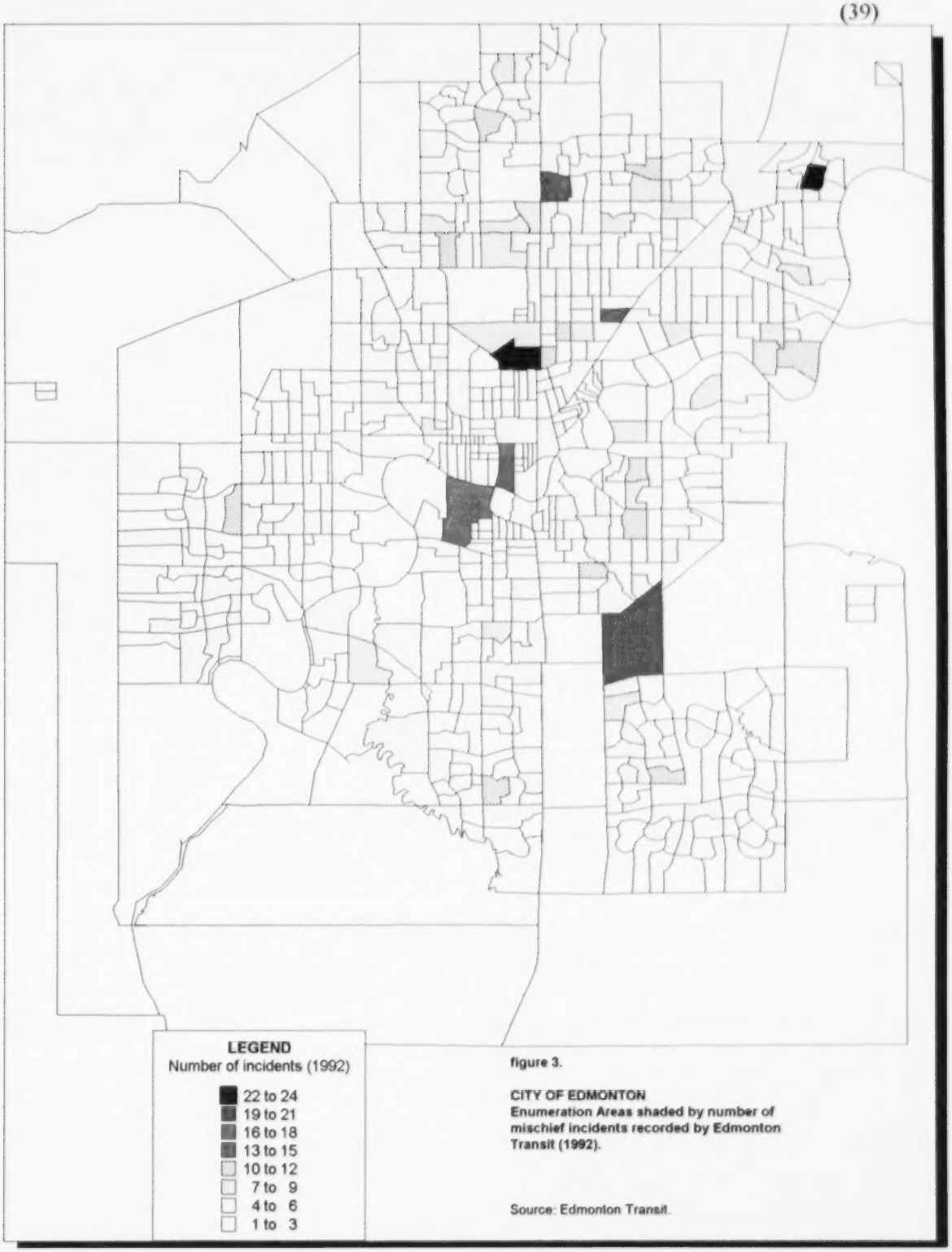


figure 3.

CITY OF EDMONTON
Enumeration Areas shaded by number of mischief incidents recorded by Edmonton Transit (1992).

Source: Edmonton Transit.

Park vandalism. The third measure of vandalism used in this study had been obtained from the Department of Parks and Recreation. Out of 402 incidents of vandalism recorded as occurring in various sites throughout the City, 393 (97.8%) were geocoded and used in the analysis. The mean number of incidents per area was less than 1, while several areas recorded over 25. As is apparent in *Figure 4*, which presents the distribution of incidents of park vandalism by area, the number of incidents was again highly concentrated in a limited number of areas. Two areas, shaded as black on the map, recorded the highest number of cases, with over 26 incidents per area; an additional 4 areas recorded between 15 and 25 incidents each. While there is some clustering of the darker shades of grey as indicative of higher levels of incidence in the central area of the City, there appears to be a greater dispersion of these cases in the outlying residential areas than was observed for the other two types of vandalism.

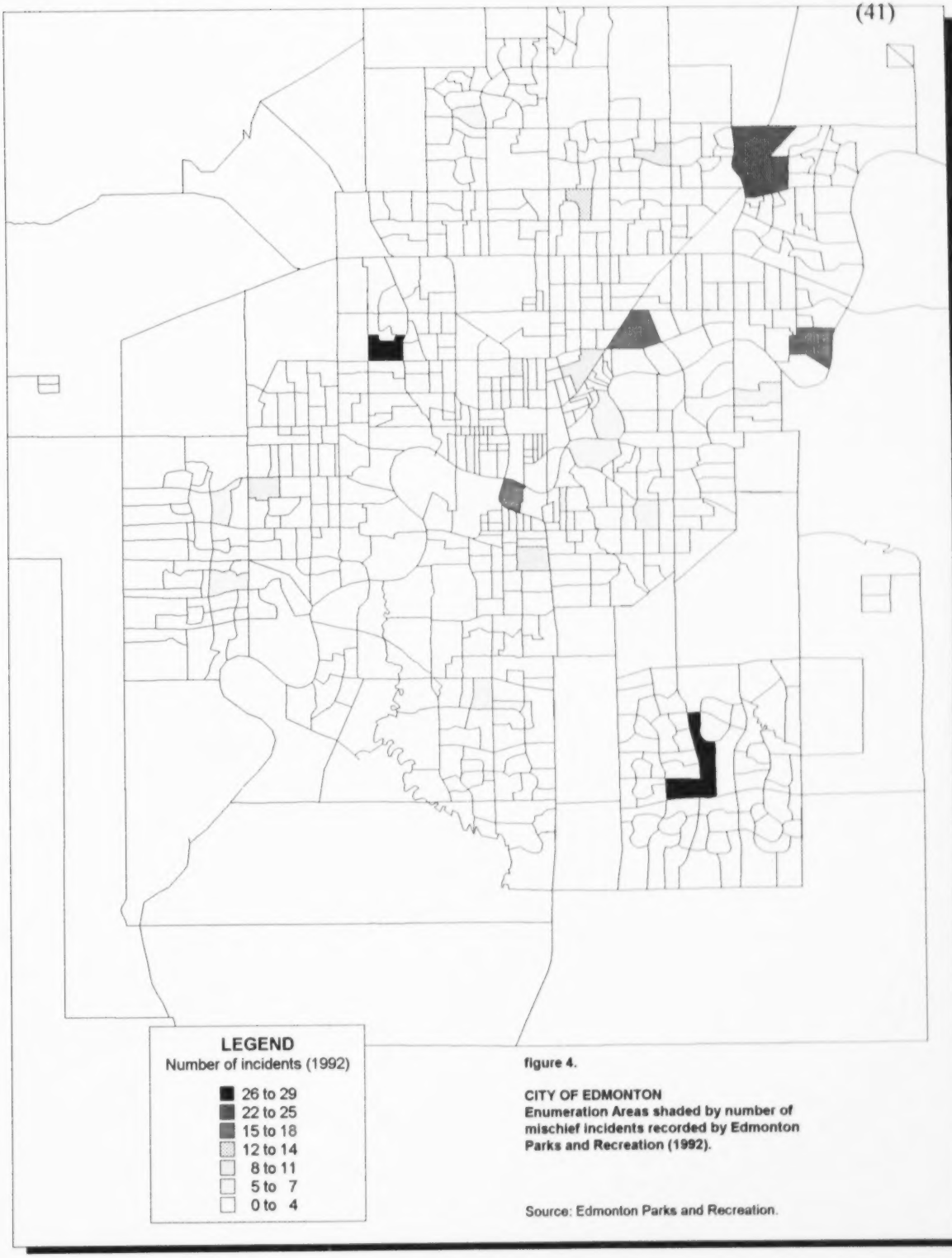


figure 4.

CITY OF EDMONTON
Enumeration Areas shaded by number of mischief incidents recorded by Edmonton Parks and Recreation (1992).

Source: Edmonton Parks and Recreation.

REGRESSION ANALYSIS OF VANDALISM INCIDENTS

An identification of common patterns derived from these three measures of vandalism is not easily accomplished by a comparison of the maps; in fact, they appear to be very different, with distinctive and unique patterns evident for each type of measurement. Moreover, this essentially descriptive examination of the data does not permit any analysis of the simultaneous effects of the social and environmental variables considered relevant as predictors. To this end, a statistical analysis of the vandalism incidents reported by each source was undertaken using stepwise multiple regression. Initial examination of the data revealed that the univariate distributions of the three measures of vandalism were skewed. In order to obtain a more linear distribution, each of the dependent variables was transformed to its natural log. The means, standard deviations, minimums and maximums of the transformed dependent variables are reported in *Table 1A*.[12]

TABLE 1A
DESCRIPTIVE STATISTICS OF TRANSFORMED DEPENDENT VARIABLES
Means, standard deviations, minimums and maximums of mischief (log), transit vandalism (log), and park vandalism (log).

Variable	*Mean*	*SD*	*Min.*	*Max.*	*Variable label*
LGMIS[a]	2.70	.79	-.69	5.04	*Mischief (log)*
LGTRANV[b]	.27	1.03	-.69	3.18	*Transit vandalism (log)*
LGPARV[c]	-.43	.67	-.69	3.37	*Park vandalism (log)*

[a] Valid N = 661.
[b] Valid N = 631.
[c] Valid N = 617.

[12]The natural log is a logarithm taken to the base "e," with "e" representing an artificial number approximately equivalent to 2.7128. Since "e" is not an integer, it cannot be readily determined what the natural log of a given number is. However, it may be interpreted as a geometrically-increasing curvilinear relationship, and is commonly illustrated as analogous to the exponential growth characteristic of population. Its use in regression may be interpreted as a percentage increase in the dependent variable for each one unit increase in the predictor variable, with the percentage amount equivalent to the value of *beta*. However, the natural log itself has no objectively interpretable meaning; hence the numbers presented in *Table 1A* are included for information purposes only (Agresti and Finlay 1986: 365; Snedecor 1946: 374; Stewart 1991: 359).

Regression analysis of mischief incidents

Bivariate correlations between the predictor variables and mischief (log) revealed statistically significant relationships for the presence of a mall in an area (r = .227), the presence of a mall in an adjacent area (r = .166), and the presence of a high school (r = .142). Among the population variables, the strongest bivariate relationships with mischief were for the proportion unemployed (r = .305), the proportion single males (r = .211), the proportion of rental occupancy (r = .266), and the proportion of male residents 20 to 24 (r = .193) (*Table 2*).

TABLE 2

CORRELATION COEFFICIENTS
Bivariate correlations between mischief incidents (log) and all predictor variables[a]

Variable	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*	*(10)*	*(11)*	*(12)*	*(13)*	*(14)*	*(15)*	*(16)*	*(17)*	*(18)*	*(19)*
(1) Mall in area	0893*	1835**	-0329	-0191	-0211	-0182	0017	-0954*	-0408	-0072	-0506	-0062	0272	0183	0895*	-0169	0364	2266**
(2) Mall in adjacent area	....	0300	0644	1305**	0754	-0708	0408	0477	-0374	0651	-0215	0365	0503	0166	0904*	0753	0702	1658**
(3) High school	....	....	0834*	0744*	-0184	-0091	-0480	-0660	-0690	-0644	-0512	-0428	-0424	-0450	0327	-0624	-0293	1418**
(4) Junior high school	....	....	....	-0238	1562**	-0251	0423	-0815*	0096	-0261	-0038	-0126	-0716	-1105**	-0444	-1140**	-0508	0384
(5) Separate high school	....	....	....	....	0868*	-0169	0113	-0206	-0231	-0108	0001	-0181	-0567	0415	-0180	-0353	-0154	0522
(6) Separate junior high	....	....	....	....	....	-0183	0251	-0445	0189	0334	-0041	-0042	-0397	-0510	-0307	-0432	0429	0447
(7) Area/square km.	....	....	....	....	....	....	-1477**	-2135**	-0032	-0802*	0778*	0782*	-0194	-1210**	-1215**	-1404**	-1010**	-1751**
(8) Total population	....	....	....	....	....	....	....	0003	5631**	3514**	3012**	2196**	-2536**	-0994*	-2963**	-0632	-2059**	0349
(9) Population density	....	....	....	....	....	....	....	....	-2140	1495**	-1776**	-0848*	3923**	4231**	4928**	3263**	1671**	0750
(10) Prop. female 10-14	....	....	....	....	....	....	....	....	....	4346**	6162**	4622**	-4513**	-1578**	-4577**	-0331	-1412**	-1240**
(11) Prop. female 15-19	....	....	....	....	....	....	....	....	....	....	2789**	4905**	1873**	1570**	-0417	2653**	0170	0266
(12) Prop. male 10-14	....	....	....	....	....	....	....	....	....	....	....	7858**	-3454**	-1684**	-3105**	-0937*	-0988*	-1324**
(13) Prop. male 15-19	....	....	....	....	....	....	....	....	....	....	....	....	-0604	-1060**	-1854**	0923*	-0226	-0211
(14) Prop. male 20-24	....	....	....	....	....	....	....	....	....	....	....	....	....	5126**	6132**	4693**	1451**	1934**
(15) Prop. 1yr./pres. address	....	....	....	....	....	....	....	....	....	....	....	....	....	....	6694**	6212**	4109**	0562
(16) Prop. rental occupied	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	4738**	4590**	2659**
(17) Prop. single male	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	5822**	2111**
(18) Prop. unemployed	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	3052**
(19) Lg mischief	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....

[a] N = 661. One outlier of maximum value omitted.
* $p < .05$, 2-tailed.
** $p < .01$, 2-tailed.

Inspection of the bivariate correlations between predictor variables did not reveal any values so high as to suggest multicollinearity (Bohrnstedt and Knoke 1988). The highest bivariate relationships were observed between several of the age/gender categories examined. Since these represent distinct groups, their relationship can be attributed to the demographic composition of areas. Hence, all predictor variables were retained for the regression analysis.

Table 3 reports the slopes (*b*), the standard error of the slope (*SE b*), and the standardized slope (*beta*) for variables which were found to be statistically significant when the log-transformed variable was regressed on the predictor variables. The proportion of unemployment in an area, the proportion of male residents aged 20-24, the total population, and the proportion rental occupancy were all predictive of increases in mischief. The size of the area and the proportion who had lived less than 1 year at their present address had a negative effect, suggesting that as these variables increased, the dependent variable of mischief would be expected to decrease. Among environmental structures, the presence of a mall in an area, the presence of a high school, and the presence of a mall in an adjacent area were also found to be significant predictors. The adjusted R^2 for all variables taken together was .264, indicating that 26.4% of the variance in mischief can be predicted by these variables.

TABLE 3
REGRESSION OF MISCHIEF (LOG)
Stepwise regression of mischief incidents recorded by Edmonton Police Service (1992), all enumeration areas.

Variable	*b*	*SE b*	*Beta*	*t*	*signif.*
Prop. unemployed	4.052801	.491507	0.3269	8.246	.0000**
Mall in area	.824184	.170900	0.1651	4.823	.0000**
Prop. male 20-24	6.692058	1.340202	0.2237	4.993	.0000**
Prop. 1yr/pres. addr.	-1.429074	.206460	-0.3298	-6.922	.0000**
Area/sq. km.	-.021356	.006304	-0.1167	-3.388	.0007**
Total population	3.81326E-04	8.0991E-05	0.1729	4.708	.0000**
Prop. rental	.572296	.148576	0.2103	3.852	.0001**
High school	.646255	.194843	0.1136	3.317	.0010**
Mall in adjacent area	.184987	.074117	0.0864	2.496	.0128*

Multiple R =	.52388
R^2 =	.27445
Adj. R^2 =	.26442
Standard Error =	.67814

Valid N = 661. * p < .05, 2-tailed. ** p < .01, 2-tailed.

The β values indicate the amount of increase in mischief that would be predicted for each standard deviation increase in the predictor, controlling for the effects of the other variables. Recalling that the natural log can be interpreted as representing a percentage increase, these results suggest that for every standard deviation unit increase in the proportion of unemployment, an increase of approximately 32.7% in the amount of mischief incidents would be expected (β = .327), controlling for the effects of the other variables.[13] Similarly, for every standard deviation unit increase in the proportion of males aged 20-24, approximately 22.4% more mischief incidents could be expected (β = .224), again controlling for the effects of the other variables. For a standard deviation increase in the proportion of rental occupancy, approximately 21% more mischief incidents would be predicted (β = .210) (Agresti and Finlay 1986; Croxton and Cowden 1946; Snedecor 1946). The t-test associated with these variables tests the probability that

[13]The interpretation of an increase in the natural log as a *percentage* increase is only accurate up to a certain point [abs(.20)]. Beyond that point, the increase in the log transformation diverges. While increases above .20 are described as percentage increases, therefore, this should be viewed as an approximation (Agresti and Finlay 1986; Stewart 1991).

these statistical results would be observed when in fact no relationship existed; the probability for all population variables was less than .01.

Since all environmental structures had been coded as dummy variables, with presence coded as "1" and absence as "0," the β can be interpreted as representing the difference between two conditional standardized means: one for areas which contain the facility in question, and one for those which do not. Hence, the β of .165 for the presence of a mall can be interpreted as predicting 16.5% more mischief in an area with a mall than in an area without one, when all other predictors are controlled. For areas which contain a high school, significantly more incidents would again be predicted ($\beta = .114$), in comparison to areas without a high school. The t-test for these statistics represents a test of the difference between these two means, and the probability that they are actually the same. The probability associated with the obtained t-values for these variables was again less than .01.

The strength of the relationship between the proportion of unemployment as a predictor of mischief incidence, and the proportion of rental occupancy, suggested that these two variables warranted further examination. Rental occupancy was dichotomized at its mean value of .439, with those areas which had a higher value categorized as "high rental occupancy," and those with a lower value as "low rental occupancy." Stepwise regression was then used to examine the relationship between the predictor variables and mischief within these two categories. In areas categorized as "high rental occupancy," the proportion of those unemployed remained the strongest predictor (*Table 4A)*; the β value of .358 indicates that for each standard deviation increase in this predictor, mischief would be predicted to increase by approximately 35.8%. The proportion of residents who were males aged 20-24 also had a strong positive effect, while the proportion of those who had lived less than one year at their current address predicted a statistically significant decrease in mischief. The presence of a mall in an area, and the presence of a mall in an adjacent area, both predict significantly higher levels of mischief, controlling for the effects of the population variables ($\beta = .246$ and $\beta = .118$, respectively).

TABLE 4A
REGRESSION OF MISCHIEF (LOG)
Stepwise regression of mischief incidents recorded by Edmonton Police Service (1992); Enumeration areas with high rental occupancy.

Variable	*b*	*SE b*	*Beta*	*t*	*signif.*
Prop. unemployed	3.326779	.535129	0.3581	6.217	.0000**
Mall in area	.940318	.200057	0.2462	4.700	.0000**
Mall in adjacent	.225885	.102041	0.1178	2.214	.0276*
Prop. male 20-24	5.665776	1.534421	0.2314	3.692	.0003**
Total population	2.8156E-04	1.2210E-04	0.1257	2.304	.0219*
Prop. 1 yr/pres.	-.919482	.311297	-0.1859	-2.954	.0034**

Multiple R =	.45254
R^2 =	.20479
Adj. R^2 =	.18845
Standard Error =	.67636

Valid N = 299. * p < .05, 2-tailed. ** p < .01, 2-tailed.

TABLE 4B
REGRESSION OF MISCHIEF (LOG)
Stepwise regression of mischief incidents recorded by Edmonton Police Service (1992); Enumeration areas with low rental occupancy.

Variable	*b*	*SE b*	*Beta*	*t*	*signif.*
Prop. unemployed	8.563722	1.543959	0.2979	5.547	.0000**
Prop. 1 yr/pres.	-1.60536	.262391	-0.2901	-6.118	.0000**
Total population	5.51882E-04	1.1114E-04	0.2473	4.966	.0000**
High school	1.024907	.257021	0.1787	3.988	.0001**
Prop. male 20-24	10.138393	3.021519	0.1575	3.355	.0000**
Area/sq. km.	-.028445	.006611	-0.2057	-4.303	.0009**
Prop. rental	1.138000	.320777	0.1886	3.548	.0004**
Pop. density	-1.00347E-04	3.0714E-05	-0.1741	-3.267	.0012**
Mall in area	.796179	.300768	0.1176	2.647	.0085**
Mall in adjacent area	.209873	.105887	0.0885	1.982	.0483*

Multiple R =	.58311
R^2 =	.34002
Adj. R^2 =	.32122
Standard Error =	.65175

Valid N = 362. * p < .05, 2-tailed. ** p < .01, 2-tailed.

For "low rental occupancy" areas (*Table 4B*), the proportion unemployed remained the strongest predictor. As the proportion of unemployed residents increased by one standard deviation, the amount of mischief would be predicted to increase by approximately 29.8% (β = .298). The proportion of those who had lived less than 1 year at their current address is again predictive of a decrease in the amount of mischief in an area, controlling for the effects of the other variables. The proportion of males 20-24 continued to be a strong predictor of increases in mischief. For these "low rental" areas, the proportion of rental occupancy itself is a significant predictor; for each standard deviation increase in the proportion of rentals, mischief would be predicted to increase by approximately 18.9% (β = .189). A mall in an area and a mall in an adjacent area were significant predictors in both "high rental" and "low rental" areas. High schools, by contrast, predict a significant increase in the amount of mischief for the "low rental" areas, but they had no statistically significant effect in the "high rental" areas.

While the proportion unemployed remained the strongest predictor of mischief in both high rental and low rental occupancy areas, the magnitude of the effect appeared to be different. Calculating a t-test based on the unstandardized slope (*b)*and standard error (*SE b*) for the two subsamples, this difference was found to be statistically significant ($t = 3.205$, $p < .01$). [14] Moreover, the amount of variance explained by the predictors included differs. In low rental areas, the adjusted R^2 of .321 indicates that approximately 32.1% of the variation in mischief in these areas can be predicted by these variables. In high rental areas, however, the adjusted R^2 of .188 indicates that approximately 18.8% of the variance is explained.

To further examine the effects of the proportion of unemployed residents, this variable was dichotomized, again based upon the mean (.074), with those areas recording higher proportions considered as "high unemployment" and those with lower values as "low unemployment." The results of regressing mischief (log) on the predictor variables within these two categories of unemployment are reported in *Table 5A* and *Table 5B*.

---

[14] The *beta*, or standardized slope, cannot be used to compare the relationship across subsamples, since it describes a relationship that is standardized within two different N's.

TABLE 5A
REGRESSION OF MISCHIEF (LOG)
Stepwise regression of mischief incidents recorded by Edmonton Police Service (1992); Enumeration areas with high unemployment.

Variable	*b*	*SE b*	*Beta*	*t*	*signif.*
Mall in area	0.709034	0.198369	0.1646	3.574	.0004**
Prop. unemployed	2.657992	0.542883	0.2551	4.896	.0000**
Total population	8.20653E-04	1.3167E-04	0.3652	6.233	.0000**
Prop. fem. 10-14	-6.472510	3.083992	-0.1318	-2.210	.0365*
Prop. rental	1.157862	.221135	0.4193	5.236	.0000**
Prop. 1 yr/pres.	-1.689371	.325909	-0.3853	-5.184	.0000**
Prop. male 20-24	4.910878	1.798700	0.1774	2.730	.0066**
Population density	-3.15302E-05	1.2303E-05	-0.1336	-2.562	.0108*

Multiple R =	.50070
R^2 =	.25070
Adj. R^2 =	.23505
Standard Error =	.62301

Valid N = 392. * p < .05, 2-tailed. ** p < .01, 2-tailed.

TABLE 5B
REGRESSION OF MISCHIEF (LOG)
Stepwise regression of mischief incidents recorded by Edmonton Police Service (1992); Enumeration areas with low unemployment.

Variable	*b*	*SE b*	*Beta*	*t*	*signif .*
Mall in area	.851993	.310686	0.1554	2.742	.0065**
Prop. unemployed	13.808166	3.489315	0.2128	3.957	.0001**
Prop. 1 yr/pres.	-1.414605	.265673	-0.3126	-5.328	.0000**
Prop. male 20-24	8.827075	1.807847	0.2819	4.883	.0000**
Area/sq. km.	-.022389	.006813	-0.1790	-3.286	.0012**
High school	.789053	.287584	0.1551	2.744	.0065**

Multiple R =	.48617
R^2 =	.23636
Adj. R^2 =	.21887
Standard Error =	.71703

Valid N = 269. * p < .05, 2-tailed. ** p < .01, 2-tailed.

Even within these subsamples, the proportion of unemployed residents remained a significant predictor of mischief. However, the proportion of rental occupancy is the most significant predictor in high unemployment areas (β = .419), while it was not statistically significant in low unemployment areas. In both the high and low unemployment areas, the proportion of residents who are males 20-24 predicts a significant increase in the amount of mischief. The presence of a mall within an area remains a significant predictor of higher levels of mischief, and appears to have a comparable effect in both subsamples of high and low unemployment (β = .165 in the former, and β = .155 in the latter). The proportion of those who had lived less than one year at their current address is observed, again, to predict a decrease in the amount of mischief in both high and low unemployment areas. The presence of a high school predicts a statistically significant increase in the dependent variable of mischief in low unemployment areas, but not for high unemployment areas; this parallels the results for rental occupancy, which found high schools statistically significant in low rental areas but not in those categorized as high rental. It should be noted, too, that among the age/gender proportions which had been presumed to be important predictors, only the proportion of males 20-24 was identified as statistically significant, a consistent effect found thus far in each step of the analysis. The exception to this general trend is observed in areas with a high proportion of unemployed residents, where the proportion of females 10-14 was found to have a significant *negative* effect (β = -.132).

Regression analysis of transit vandalism

Several significant bivariate relationships between the predictor variables and the dependent variable of transit vandalism (log) were identified, as reported in *Table 6.* Consistent with what was found for mischief, the presence of a mall in an area and the presence of a high school were statistically significant at $p < .01$, with r = .175 for malls and r = .136 for high schools. However, the presence of a junior high school had a significant bivariate relationship with transit vandalism (r = .112), while it was not significant for mischief. Among the population variables, none were statistically significant expect population density (r = -.196), which revealed a significant negative effect, and the proportion of those who had lived less than a year at their current address, which had a small but significant negative effect (r = -.089, $p < .05$). While smaller in magnitude than the bivariate relationships observed for mischief, these effects are in the same negative direction.

TABLE 6

CORRELATION COEFFICIENTS
Bivariate correlations between transit vandalism (log) and all predictor variables[a]

Variable	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*	*(10)*	*(11)*	*(12)*	*(13)*	*(14)*	*(15)*	*(16)*	*(17)*	*(18)*	*(19)*
(1) Mall in area	.0875*	.1826**	-.0345	-.0200	-.0222	.0054	-.0048	-.1045*	-.0403	-.0119	-.0691	-.0034	.0242	.0186	.0847*	-.0234	.0334	.1746**
(2) Mall in adjacent area	....	.0280	.0617	.1297**	.0740	-.0468	.0236	.0320	-.0381	.0536	-.0150	.0617	.0442	.0180	.0721	.0648	.0648	.0645
(3) High school		....	.0822*	.0766*	-.0193	-.0186	-.0567	-.0733	-.0691	-.0708	-.0711	-.0539	-.0464	-.0481	.0270	-.0707	-.0326	.1360**
(4) Junior high school			....	-.0249	.1552**	-.0021	.0369	-.0917*	.0111	-.0327	.0046	-.0109	-.0775	-.1175**	-.0555	-.1272**	-.0557	.1122**
(5) Separate high school				....	.0861*	-.0068	.0072	-.0257	-.0227	-.0144	.0062	-.0210	-.0604	-.0443	-.0242	-.0413	-.0181	-.0392
(6) Separate junior high					....	-.0086	.0121	-.0466	.0244	.0311	-.0003	-.0003	-.0332	-.0536	-.0316	-.0392	.0534	.0276
(7) Area/square km.						....	.0221	-.1754**	.0103	-.0284	.0462	-.0123	-.0539	-.1286**	-.1036**	-.1331**	-.0737	.0597
(8) Total population							....	-.0589	.5834**	.3114**	.5575**	.3775**	-.2778**	-.1631**	-.3448**	-.1193**	-.2379**	.0719
(9) Population density								....	-.2221	.1311**	-.2230**	-.0740	.3998**	.4557**	.4885**	.3216**	.1518**	-.1956**
(10) Prop. female 10-14									....	.4342**	.8757**	.5715**	-.4608**	-.2028**	-.4712**	-.0472	-.1392**	.0038
(11) Prop. female 15-19										....	.4404**	.6900**	.1924**	.1171**	-.0589	.2496**	.0066	-.0223
(12) Prop. male 10-14											....	.6097**	-.4731**	-.1976**	-.4780**	-.0071	-.1293**	-.0046
(13) Prop. male 15-19												....	-.0570	-.0932*	-.2748**	.2234**	-.0087	.0227
(14) Prop. male 20-24													....	.5500**	.6111**	.4711**	.1346**	-.0516
(15) Prop. 1yr/pres. address														....	.7474**	.6438**	.4340**	-.0889*
(16) Prop. rental occupied															....	.4734**	.4562**	.0181
(17) Prop. single male																....	.5919**	-.0076
(18) Prop. unemployed																	....	.0577
(19) Lg transit vandalism																		....

[a] N = 631.
* $p < .05$, 2-tailed.
** $p < .01$, 2-tailed.

When transit vandalism (log) was regressed on the predictor variables (*Table 7*), the strongest effect among the population variables was observed for the proportion of rental occupancy (β = .304). Additional positive effects were identified for the proportion of single males (β = .124) and the total population, while population density and the proportion who lived for less than one year at their current address predict a significant decrease in transit vandalism. Among the environmental structures, the presence of a mall, the presence of a high school and the presence of a junior high school all predicted a significantly higher amount of transit vandalism in areas where they were present, controlling for the effects of all other variables (β = .120, β = .086, and β = .085, respectively). The t-test for the difference between means for these variables was, in all cases, statistically significant ($p < .01$ for the presence of a mall, and $p < .05$ for the presence of a high school or a junior high school). Taken together, these variables explain about 11.4% of the variance in the dependent variable (adjusted R^2 = .114).

TABLE 7
REGRESSION OF TRANSIT VANDALISM (LOG)
Stepwise regression of vandalism recorded by Edmonton Transit (1992); All enumeration areas.

Variable	*b*	*SE b*	*Beta*	*t*	*signif.*
Population density	-8.22239E-05	1.5750E-05	-0.2328	-5.221	.0000**
Mall in area	.754110	.247791	0.1200	3.084	.0021**
Prop. rental	1.088140	.227342	0.3039	4.786	.0000**
Prop. 1 yr/pres.	-1.485928	.385603	-0.2552	-3.854	.0001**
Total population	4.13420E-04	1.2190E-04	0.1385	3.391	.0007**
High school	.625019	.279801	0.0861	2.234	.0254*
Prop. single male	2.061827	.819683	0.1239	2.515	.0121*
Junior high	.443107	.197895	0.0854	2.239	.0255*

Multiple R =	.35354
R^2 =	.12499
Adj. R^2 =	.11374
Standard Error =	.97130

Valid N = 631. * $p < .05$, 2-tailed. ** $p < .01$, 2-tailed.

The strong relationship identified for the proportion of rental housing as a predictor for transit vandalism when other variables were controlled for suggested, again, that some further examination of its effects was warranted, particularly when it is recalled that the bivariate correlation between these two variables was relatively

weak (r = .018, *Table 6*). Rental occupancy was dichotomized into two categories of "high rental" and "low rental," again using the mean of .439 as a cut-point. The dependent variable of transit vandalism (log) was then regressed on the predictor variables within these categories. In areas described as high rental occupancy (*Table 8A*), the only population variables which were found to significantly predict transit vandalism were total population, which predicts an increase (β = .161), and the population density, which predicts a significant decrease (β = -.304). The presence of a mall and the presence of a high school continue to predict signficantly more transit vandalism (β = .165 and β = .124). These four variables, taken together, explain approximately 18% of the variance in the log of the dependent variable for high rental areas (adjusted R^2 = .180).

TABLE 8A
REGRESSION OF TRANSIT VANDALISM (LOG)
Stepwise regression of vandalism recorded by Edmonton Transit (1992); Enumeration areas with high rental occupancy.

Variable	*b*	*SE b*	*Beta*	*t*	*signif.*
Population density	-8.49014E-05	1.4961E-05	-0.3036	-5.675	.0000**
Mall in area	0.856047	.283228	0.1651	3.022	.0027**
Total population	4.89849E-04	1.6297E-04	0.1611	3.051	.0024**
High school	0.902766	.391331	0.1244	2.307	.0218*

Multiple R =	.43726
R^2 =	.19119
Adj. R^2 =	.18011
Standard Error =	.92622

Valid N = 297. * p < .05, 2-tailed. ** p < .01, 2-tailed.

For low rental occupancy, by contrast, the proportion of rental occupancy was found to be the strongest predictor (β =.236), while the proportion who lived at their current address less than one year was again found to predict less transit vandalism (*Table 8B*). While these two variables are statistically significant (p < .01), it should be noted that they explain very little variance in the dependent variable: adjusted R^2 = .047, indicating that approximately 4.7% of the variance is explained.

TABLE 8B
REGRESSION OF TRANSIT VANDALISM (LOG)
Stepwise regression of vandalism recorded by Edmonton Transit (1992); Enumeration areas with low rental occupancy.

Variable	*b*	*SE b*	*Beta*	*t*	*signif.*
Prop. rental	1.911459	.490196	0.2357	3.899	.0001**
Prop. 1yr/pres.	-1.776680	.515690	-0.2083	-3.445	.0006**

Multiple R =	.23061
R^2 =	.05318
Adj. R^2 =	.04746
Standard Error =	1.01520

Valid N = 334. * $p < .05$, 2-tailed. ** $p < .01$, 2-tailed.

Regression analysis of park vandalism

The bivariate relationships between the predictor variables and the log of park vandalism *(Table 9)* revealed statistically significant correlations for the presence of a mall in an area (r = .207) and the presence of a high school (r = .265). These relationships are comparable to those found for the two other measures of vandalism. For park vandalism, however, a third variable, the presence of a high school from the Separate school system, is also statistically significant (r = .181); and this relationship was not observed for the other two measures. Among population variables, a significant negative correlation is found between transit vandalism and population density (r = -.208), again paralleling correlations observed for the other two types of vandalism. The only other population variable that suggests a statistically significant bivariate relationship is the proportion of females aged 15 to 19 (r = -.086). In addition, the size of an area in square kilometres is observed to have a positive correlation with park vandalism.

TABLE 9

CORRELATION COEFFICIENTS
Bivariate correlations between park and recreational vandalism (log) and all predictor variables[a]

Variable	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*	*(10)*	*(11)*	*(12)*	*(13)*	*(14)*	*(15)*	*(16)*	*(17)*	*(18)*	*(19)*
(1) Mall in area	.0717	.1986**	-.0342	-.0187	-.0220	.0499	-.0054	-.1006*	-.0292	-.0245	-.0592	.0012	-.0119	.0027	.0769	-.0550	.0347	.2072**
(2) Mall in adjacent area	....	.0375	.0670	.1496**	.0783	-.0967*	.0368	.0343	-.0227	.0631	.0056	.0666	.0144	-.0243	.0419	.0011	-.0156	.0105
(3) High school		....	.0873*	.0876*	-.0190	.0359	-.0342	-.0636	-.0567	-.0489	-.0588*	-.0318	-.0256	-.0209	.0503	-.0296	-.0172	.2650**
(4) Junior high school			....	-.0240	.1546**	.0333	.0288	-.0941*	.0052	-.0403	-.0010	-.0161	-.0758	-.1221**	-.0526	-.1410**	-.0530	.0501
(5) Separate high school				....	.0928*	.0069	.0100	-.0545	-.0223	-.0337	.0060	-.0369	-.0710	-.0751	-.0438	-.0646	-.0433	.1812**
(6) Separate junior high					....	-.0067	.0231	-.0303	.0075	.0505	-.0061	.0029	-.0249	-.0226	-.0140	-.0455	.0631	.0056
(7) Area/square km.						....	.2832**	-.4628**	.1968**	-.0433	.1945**	.0706	-.2697**	-.2409**	-.3827**	-.2157**	-.1809**	.2250**
(8) Total population							....	-.0893*	.5697**	.2654**	.5458**	.3474**	-.2989**	-.2153**	-.3684**	-.2034**	-.2553**	-.0459
(9) Population density								....	-.2517**	.1045**	-.2503**	-.1093**	.4199**	.4457**	.4984**	.3116**	.1495**	-.2078**
(10) Prop. female 10-14									....	.4169**	.8737**	.5592**	-.4738**	-.2388**	-.4874**	-.0883*	-.1403**	-.0420
(11) Prop. female 15-19										....	.4243**	.6787**	.1973**	.0726	-.0710	.2049**	.0113	-.0857*
(12) Prop. male 10-14											....	.5992**	-.4845**	-.2336**	-.4873**	-.0421	-.1276**	-.0468
(13) Prop. male 15-19												....	-.0585	-.1498**	-.2993**	.1809**	-.0171	-.0420
(14) Prop. male 20-24													....	.5629**	.6000**	.4892**	.1232**	-.0776
(15) Prop. 1yr/pres. address														....	.7639**	.6080**	.4104**	-.0497
(16) Prop. rental occupied															....	.4826**	.4553**	.0207
(17) Prop. single male																....	.5750**	-.0034
(18) Prop. unemployed																	....	.0782
(19) Lg. park vandalism																		....

[a] N = 617.
* $p < .05$, 2-tailed.
** $p < .01$, 2-tailed.

The results obtained from regression of park vandalism (log) on the predictor variables are reported in *Table 10*. The presence of a mall and the presence of a high school were predictive of significantly more park vandalism in areas where they are located than in areas where they are absent (β = .128 for malls and β = .198 for high schools). This effect is consistent with the patterns observed in the other measures of vandalism. However, higher levels of park vandalism are also predicted for areas with a Separate high school (β = .162), an effect which was not found for either mischief or for transit vandalism. Of the population variables observed to be statistically significant in predicting park vandalism, both population density and the proportion of residents who lived at their current address for less than a year were found to have negative effects, relationships which have remained consistent in the analyses reported thus far.

TABLE 10
REGRESSION OF PARK VANDALISM (LOG)
Stepwise regression of vandalism recorded by Edmonton Parks and Recreation (1992); All enumeration areas.

Variable	*b*	*SE b*	*Beta*	*t*	*signif.*
High school	.953497	.179843	0.1981	5.302	.0000**
Area/sq. km	.311618	.061579	0.2136	5.060	.0000**
Separate HS	.950110	.214532	0.1617	4.429	.0000**
Mall in area	.534033	.157028	0.1277	3.401	.0007**
Prop. unemployed	1.089987	.455378	0.0989	2.394	.0170*
Population density	-.316590E-05	1.0455E-05	-0.1387	-3.028	.0026**
Prop. rental	.470831	.147331	0.2018	3.203	.0014**
Prop. 1 yr./pres.	-.446519	.224266	-0.1151	-1.991	.0469*

Multiple R =	.45027
R^2 =	.20274
Adj. R^2 =	.19225
Standard Error =	.59795

Valid N = 617. * $p < .05$, 2-tailed. ** $p < .01$, 2-tailed.

Although there had been no statistically significant bivariate correlation for the proportion of unemployment with park vandalism (r = .078, *Table 9*), a significant relationship was observed in the regression analysis. When the effects of the other variables are controlled for, a standard deviation unit increase in the proportion of unemployment predicts an increase of approximately 9.9% in park

vandalism (β = .099). Similarly, there was no significant bivariate relationship observed for the proportion of rental occupancy (r =.021). In the regression analysis, however, a standard deviation increase in the proportion of rental housing predicts approximately 20% more park vandalism when the effects of the other variables are controlled for (β = .202). Exploring these effects further by regressing park vandalism on the predictor variables under different levels of either unemployment or rental occupancy, however, proved to be impracticable. Park vandalism, it may be recalled, was the smallest of the data sets examined; and when the areas were divided into high and low unemployment, and high and low rental occupancy, there was insufficient variation in the dependent variable in the "low" conditions to produce a regression analysis. Almost all of the park vandalism had occurred in areas which might be described as high rental, high unemployment areas. The adjusted R^2 reported for the regression of park vandalism was .192, indicating that 19.2% of the variance could be predicted by these variables.

Unemployment and rental occupancy

The finding that both the proportion of unemployment in an area and the proportion of rental occupancy are significant predictors of park vandalism in the regression analysis, while they did not appear to have significant bivariate relationships, raises the possibility of an interaction between these two variables. This possibility had previously been suggested by the regression analyses of mischief and transit vandalism, and was the rationale for dichotomizing these variables and considering the effects of the predictors within categories of high versus low rental occupancy, and high versus low unemployment. Proceeding in this way controls for, or removes, the effects of one variable (the one dichotomized), to permit a closer examination of the effects of the other(s).

Examining again *Tables 4A* and *4B,* and *Tables 5A* and *5B,* the effects of this partialing may be observed for the prediction of mischief incidents. In high rental areas *(Table 4A)* it may be noted that unemployment remained a strong predictor of mischief incidence, while the effects of rental occupancy were not found to be statistically significant. In low rental areas (*Table 4B*), both the proportion of unemployment and the proportion of rental occupancy were statistically significant, predicting an increase in mischief. Conversely, in areas which were categorized as high unemployment (*Table 5A*), the proportion of unemployment remained a strong predictor, while the effects of the proportion of rental occupancy were stronger than in the first analysis of all areas taken together. In low unemployment areas, however, (*Table 5B*), the proportion of rental occupancy was not identified as a statistically significant predictor.

To further examine the relationship between these two variables, the proportion of rental occupancy was regressed on the predictor variables.[15] The proportion of unemployment was a significant predictor of rental occupancy (*Table 11*), as was the proportion of males aged 20-24 and the proportion of residents who had lived less than a year at their current address. The proportion of single males was a significant negative predictor. Taken together, these variables explain 61.3% of the variation in rental occupancy (adjusted $R^2 = .613$).

TABLE 11
REGRESSION OF PROPORTION RENTAL OCCUPANCY
Stepwise regression of proportion rental occupancy on predictor variables; All enumeration areas.

Variable	*b*	*SE B*	*Beta*	*t*	*signif.*
Prop. 1 yr./pres.	.680632	.052338	0.4277	13.005	.0000**
Prop. male 20-24	4.770588	.325577	0.4340	14.653	.0000**
Prop. unemployed	1.500078	.139297	0.3293	10.769	.0000**
Prop. single male	-.851056	.165332	-0.1870	-5.148	.0000**

Multiple R =	.78420
R^2 =	.61498
Adj. R^2 =	.61263
Standard Error =	.18070

Valid N = 662. * $p < .05$, 2-tailed. ** $p < .01$, 2-tailed.

It seems, then, that rental occupancy is not, by itself, a significant predictor of mischief or vandalism; its effects are conditioned by other variables, particularly the proportion of unemployment. In areas characterized by relatively low unemployment, the effects of a greater proportion of rental occupancy are negligible; and in areas characterized by high rentals, the *proportion* of rentals is not significant. In high unemployment areas, however, both the proportion of rental occupancy and the proportion of unemployment predict significant increases in the amount of mischief. These findings, in turn, may point to the important role of a construct which was not included in the present research, that of socioeconomic status. Both high rental occupancy and high unemployment are characteristic of low

[15]All 662 enumeration areas were used. The case excluded from the analysis of mischief had recorded an extremely high number of incidents of mischief, and was therefore treated as an outlier. This area, however, was not unique with respect to its population composition, and there was therefore no justification for excluding it for the current analysis.

income areas. However, while these two measures may be "highly saturated" with socioeconomic status (Kornhauser 1978: 85), they are only crude proxies for it. Since the census data used in this analysis contained no information on average income levels or the median value of housing, which might have provided a more direct assessment, the possibility of this relationship could not be investigated further. This issue, and its implications for predicting vandalism from a routine activities perspective, is discussed in the following chapter.

TESTING THE HYPOTHESES

Although the three different measures of vandalism examined here revealed distinctive patterns of distribution in the initial mapping, and some divergent findings in the statistical analyses, a number of consistent results have been identified. The similarities become more apparent when the results from each analysis, taken together, are examined from the perspective of the specific hypotheses developed in Chapter 2.

The *first hypothesis* stated that vandalism would be higher in areas with a large proportion of male teenagers. Of the five age/gender specific categories included as variables in this study, however, only the proportion of males aged 20-24 was found to be statistically significant. This effect was observed in the analysis of mischief incidents, both in the initial regression and in all subsamples. The only other age/gender category which proved to be significant was the proportion of residents who were females aged 10-14; this group had a statistically significant *negative* effect for mischief in the "high unemployment" subsample. This hypothesis, then, is not supported by the results.

The *second hypothesis* dealt with the residential environment of the enumeration areas, and stated that vandalism would be higher in areas where a larger proportion of residents were unemployed, where more residents were single males, where there was more rental housing, and where more residents were relatively new to the area. It also predicted lower levels of vandalism in areas of high density. The proportion of unemployment, as discussed above, proved to be a significant predictor of mischief in all subsamples. In addition to its direct effects, this variable had an indirect effect through its relationship with the proportion of rental occupancy. The effect of rental occupancy, however, while identified as statistically signficant, was observed to be largely conditioned by the effects of other variables which measured the residential environment. Rental occupancy was itself strongly predicted by the proportion of unemployment and the proportion of males 20-24, both of which, in turn, were identified as significantly and postively predictive of higher vandalism. Yet the porportion of those who had lived at their present address

less than one year also predicts higher rentals, and the proportion of these new residents was identified as having a direct *negative* effect on vandalism, in contrast to the positive relationship hypothesized. The predicted negative effect of population density, however, was identified as statistically significant at most stages of the analysis. Overall, the hypothesis about the residential environment proved to have only partial support.

The *third hypothesis* stated in Chapter 2 had predicted that areas which contained a public junior or senior high school would also have significantly higher levels of vandalism, controlling for the expected effects of the demographic composition of residents and the residential environment. Public high schools were observed to predict significantly higher vandalism, an effect which recurred in most of the analyses and for all three measures. Consistent with both the hypothesized relationship and the previous literature, the significant relationship identified for high schools applied only to those of the *public* school system, with one exception: Separate high schools were found to have a moderate positive effect for park vandalism. Closer examination of the areas containing a Separate high school, however, revealed that of these nine areas, one also contained a public high school; one contained a mall; and five others were adjacent to a mall. While there were an insufficient number of cases to analyze an interactive effect, such a relationship seems plausible, and is given some support by the observation that the one area which contained both a public and a Separate high school had a very high incidence of park vandalism, compared to other areas.

In contrast to the prominent effect identified for high schools, the presence of a junior high school proved to be of negligible importance. Although these schools were observed to have a statistically significant effect in predicting transit vandalism, they did not predict a substantial amount of variation for either mischief or park vandalism. Moreover, when the impact of the residential environment was further controlled for in the comparison of high and low rental subsamples for transit vandalism, the presence of a junior high was no longer identified as significant. These results, then, provide support for the hypothesized relationship with respect to the presence of a public high school, but provide insufficient support for rejecting the null hypothesis for the presence of a public junior high school.

The *final hypothesis* posed in this study had stated that vandalism would be higher in areas which contained or were adjacent to a shopping mall. The presence of a mall in an area was observed to have a consistent strong positive effect, in almost every stage of the analysis (the single exception was found for the low-rental subsample in the analysis of transit vandalism). The observed effect was both statistically significant ($p < .01$ in each analysis) and substantively so, predicting a marked difference in the levels of vandalism for areas with a mall compared to those

without one. For areas adjacent to a mall, however, the results were both less consistent and weaker. While these areas were predicted to have a significantly higher amount of mischief, the same effect was not observed for either transit or park vandalism. Hence, this hypothesis is again only partially supported, with statistically significant effects observed for the presence of a mall in an area but not for the presence of a mall in an adjacent area.[16]

---

[16]The one enumeration area excluded from the analysis of mischief as an outlier because of the extreme number of incidents (260) recorded there was unremarkable in its social and residential attributes. It was lower than the City mean for total population, the number of residents in the five age/gender categories, the amount of unemployment, and the number of single males. Only the proportion of rental occupancy and of residents who had lived less than a year at their current address were higher than the mean. Rentals made up 49.7% of residences in this area, compared to 49.3% in the City. Slightly less than 60% of residents had lived at their current address for less than one year, while the average for the City was 45.1%. Even for these variables, however, these amounts are within one standard deviation of the mean. However, this area hosts an architectural phenomenon touted as "the world's largest shopping mall." The relative size of a mall was not assessed in this analysis; all malls included were coded as dummy variables, although some of these facilities are much larger than others. It was expected that a shopping mall, regardless of its physical dimensions, would contribute to higher levels of vandalism in the surrounding area in two ways. First, as a public facility which draws people into its environs and provides an attractive site for socializing, a mall fosters the convergence of a variety of people including potential offenders. In addition, the routine bustle generated by a mall as patrons enter and depart from its premises impedes guardianship in the surrounding streets, by making it more difficult to distinguish between legitimate and illegitimate activities. From this perspective, the mega-mall found in the omitted area is legitimately considered an exceptional case, because its unusual combination of facilities makes it an attraction not only for people from the entire City but from outside of the City as well. If the consistent effect for the presence of a mall discussed above can be attributed to the convergence of offenders and reduced guardianship, as argued, then this facility's unique properties would grossly exaggerate those effects and it should not be viewed as comparable to other malls.

CHAPTER 5

DISCUSSION AND CONCLUSION

DISCUSSION

The three data sets used in this study were very different in terms of the type of targets they included, and the way in which vandalism was measured. Each was vulnerable to differing sources of error in measurement that might render the data invalid. The data obtained from the Edmonton City Police Service, while containing the largest number of incidents and reporting single acts of mischief involving a variety of targets, may also have included an unknown number of actions that would not be considered vandalism. In addition, the minor nature of the offence and expectation of little satisfaction from a criminal investigation mean that vandalism may be underreported. Thus, the number of incidents recorded may not represent the extent of incidence. A further and potentially more damaging source of distortion arises with the possibility that reporting of incidents and police response could vary by area.

Records obtained from the Department of Transit were less subject to potential distortion from differential reporting because they were gathered from actual damage reports. Uncertainty regarding the nature of the actions involved was also less likely to have been a substantial source of error. Since the targets involved are spartan in construction, providing less opportunity for variation in the types of damage, most of the incidents reported may have been accurately assessed as vandalism. These records do not, however, report single incidents. Transit maintenance personnel visited each shelter once a month, so that a single record could represent a single act of vandalism or an unknown number of separate acts.

The possibility of cumulative damage is an issue for reports on vandalism obtained from the Department of Parks and Recreation as well, since they were also generated from periodic maintenance visits. A given record could reflect a single incident of vandalism, or an unknown number of incidents that occurred over a period of time. In addition, these records included various types of damage to many different potential targets. There was therefore greater potential for variation in the interpretation and reporting of vandalism.

Moreover, potential threats to the validity of both transit and park records are inherent in the lack of a means of assessing either *use patterns* or *target availability*. *Use patterns*, reflecting how much traffic a particular bus route or park supported, might affect the amount of vandalism that occurred. Facilities that experienced light traffic might be more subject to damage because the lack of legitimate users left

them frequently empty, rendering them convenient and unguarded targets. *Target availability* could also influence the number of incidents reported in an area. Some areas in the City may have many bus shelters, so that the total number of incidents reflects only occasional damage to each, while others may have only a few shelters that were vandalized several times. Similarly, certain areas of the City contained large tracts of parkland within their boundaries, encompassing a variety of facilities that together provided a multitude of targets. Other areas, by contrast, had a minimal amount of open grass, overlooked on all sides by houses.

These differences would affect the amount of damage that occurred, since they influence both the availability of targets and opportunity. The data available for this study, unfortunately, did not allow any evaluation of these factors. They therefore represent additional sources of potential distortion in the counting of incidents.

The difficulties inherent in the measurement and counting of vandalism in each of these three data sets are substantial enough that they pose a serious threat to the validity of any one measure, taken alone. Yet by their very differences, these measures lend credibility to each other. The observation that areas with a high proportion of unemployment have higher levels of mischief is vulnerable to the accusation that these reports reflect differential police activity, rather than actual differences (Hagan, Gillis and Chan 1978). This argument, however, cannot be made about the finding that park vandalism is higher in these areas. Similarly, that transit vandalism appears higher in the areas around malls and high schools might be dismissed as spurious, resulting from the greater number of transit shelters around these facilities placed there to meet the demands of increased traffic. A parallel argument, however, cannot as easily be made regarding higher rates of mischief in these areas. The consistent and recurring effects identified for all three sets of data might only be spurious if citizens over-report and police over-record in certain areas of the City which also contain an overabundance of transit shelters *and* extensive parks. While this is possible, it seems unlikely.

The identification of the same variables in the analyses of all three measures, then, underscores their significance as predictors of vandalism. The common patterns identified in this analysis are that vandalism was found to be higher in areas characterized by high unemployment and high rentals; areas that contained a larger proportion of males between 20 and 24; and those that contained a shopping mall or high school. It was observed to be lower in densely-populated areas, and those that contained a high proportion of new residents.

That areas of high unemployment and high rentals suffer higher levels of vandalism is not a singular finding. Nor is the observation that more vandalism occurs in areas inhabited by a large number of young males. These findings are

almost redundant, since areas with these particular social and demographic characteristics have been repeatedly and consistently demonstrated to experience higher levels of crime of all types, throughout several decades of criminological research. In addition, areas with high unemployment and high rentals represent the poorer sections of the City, and there is almost universal acceptance of the idea that vandalism is rampant in such areas.

The central issue, however, is not whether this is the case, but *why* vandalism occurs in these areas. Are the residents of poorer neighbourhoods more inclined to damage and destroy their surroundings than residents in better neighbourhoods? Some writers have argued that they are. Roos, for example, based on the same observation of higher levels of vandalism in poorer neighbourhoods, concludes that vandals act to free themselves of "unwanted marginalization." Plagued by a lack of social ties and an "excess of nonmeaningful choices," vandals destroy the symbols of a society that has largely excluded them. Vandalism is described as ". . . a form of nonverbal communication, exemplified by the mutilation of objects and environments for which the perpetrator does not feel any 'code fellowship'" (Roos 1992: 75, 81).

This argument may be a valid one. It cannot be supported, however, based on the observation of higher levels of incidence in areas characterized by certain social attributes. Demonstrating statistically significant relationships in aggregate rates of occurrence only predicts *where* vandalism is likely to occur, not *who* is likely to commit it. Residents of high-unemployment, high-rental areas may be no more destructive than residents of other areas; yet vandalism may be more prevalent there for other reasons.

This possibility becomes more apparent when other predictors of higher vandalism are considered, such as the presence of a mall or a high school in an area. The argument that residents of areas near a mall are more destructive than residents of other areas is clearly specious. While some of these residents may be vandals, there is little question that the higher rates of vandalism that are found in these areas are largely the consequence of the human traffic that such facilities generate. A parallel argument may be made concerning the recurring observation that a higher proportion of new residents in an area predicts *lower* levels of vandalism, as does population density. Does this mean that new residents, or those in highly dense areas, are less destructive than residents who have lived in an area longer or who live elsewhere?

It seems readily apparent that the variations in vandalism predicted by the locations of malls and schools, the proportion of new residents, and the population density are due to differences in the residential environment that have little, if anything, to do with the destructive inclinations of those who live in these areas. It

may be just as reasonable to argue that the higher rates of vandalism found in poorer areas, characterized by high unemployment and rental housing, are also due to factors in the residential environment that are largely divorced from the criminality of residents. These environmental factors may develop according to the social ecology of the City, as a reflection of routine human activities.

ROUTINE ACTIVITIES AND VANDALISM

Routine activities theory asserts that crimes occur because of the convergence of potential offenders, available targets, and reduced guardianship. These elements are assumed to converge non-randomly in time and space. The observation that criminal acts repeatedly occur in a limited number of locations, or "hot-spots," is thus interpreted as reflecting the social environment of these areas and their surroundings, which regularly and repeatedly permit the convergence of these factors. In applying this perspective to vandalism, it was argued in Chapter 2 that the most significant components leading to vandalism were the convergence of potential offenders, and reduced guardianship resulting from human activities dictated by the social and physical environment. At this point, then, the arguments made for a routine activities explanation of vandalism need to be reevaluated, and in some cases revised, in light of the findings reported in the previous chapter.

The residential environment and guardianship

Areas with a high proportion of rental housing, it was argued, could be expected to experience greater amounts of vandalism because the more transient residents assumed to inhabit such areas would be less familiar with their neighbours and with normal neighbourhood activity. They would presumably be less able to distinguish between legitimate and illegitimate activities, and therefore would be unable to exercise suitable guardianship. Yet a higher proportion of rentals was not found, *by itself,* to be a significant predictor of higher vandalism. This suggests that the transiency assumed to exist in high-rental areas is not an adequate explanation, a conclusion which is underscored by the consistent finding that the proportion of residents who had lived less than a year at their current address, expected to more directly measure transiency, was predictive of *lower* vandalism. Clearly, a more complex process is involved than simply the lack of neighbourhood familiarity and greater transiency assumed to exist in areas characterized by high rentals.

High-rental neighbourhoods, at least in the city where this research was conducted, vary widely in terms of the type of housing involved and the average income level of residents. Some more densely-populated areas, particularly those

near (but not in) the City centre, consist almost entirely of high-rise apartment buildings. This type of dwelling would be expected to have a high proportion of rentals, a larger proportion of new residents, and occupants who are not at home during the day because they are employed full time. While the combination of these factors would be expected to inhibit informal surveillance and supervision, they may be overshadowed by other factors inherent in this type of dwelling that enhance guardianship, and reduce the opportunities for vandalism.

Although not all high-rise buildings have formal security systems, many do; and almost all have a locked-entry policy that limits access to the interior of the building. This provision would limit most vandalism to the buildings themselves to the exterior, where it would be concentrated at or near ground level (Wilson 1978). At the same time, areas where this type of building dominate may suffer less vandalism in the surrounding public areas and streets simply because their smaller size limits the availability of targets. The enumeration areas used as the unit of aggregation in this study were defined to some extent by the total resident population, with some densely-populated areas as small as two city blocks in size. That these factors may result in a lower area rate of vandalism is given some support by the finding that population density consistently predicts lower vandalism according to all three measures used in this analysis.

By contrast, some areas of the City contain an entirely different type of rental housing that includes low-rise apartment buildings, row housing, and multiplexes. These types of housing, rather than high-rise apartment blocks, are most characteristic of lower income areas of the City, and are the likely locales for high unemployment and high rental occupancy to converge (Edmonton Public Housing Authority 1994). Areas where these housing facilities dominate lack the type of structurally-imposed guardianship that was described above for larger apartment blocks. Instead, these residences often include common areas in parking lots, pathways, and open spaces between buildings. These public areas may render informal surveillance and supervision more difficult, and the lack of ownership implicit in such public land use may discourage residents from intervening in questionable activities (Geason and Wilson 1990; Newman 1973; Wilson 1978).

Moreover, the routine daily activities of residents may be less predictable in areas of high unemployment. Lacking the imposed constraints of a daily work schedule, unemployed persons are more likely to enter and depart their premises according to idiosyncratic circumstances, rather than according to a repetitive and habitual routine. Residents of these areas are thus less likely to be able to assess the legitimacy or illegitimacy of neighbourhood traffic, and may therefore fail to challenge activities or persons about whom they are uncertain.

While these arguments about residential housing and its implications for vandalism are plausible and are consistent with the results found in this research, they are largely speculative. An empirical evaluation of these factors would require the inclusion of several variables which could more directly assess the residential and social environment, but which were unavailable for the present study. These include a measure of average household income, the median value of housing, and the proportion of specific *types* of dwelling units.

Age and gender. An extensive literature from a variety of sources including both official statistics and self-report studies has identified teens, particularly male teens, as the most likely vandals. Based on this observation, and given some support by a British study that identified child density as the most significant factor in predicting vandalism on residential housing estates, it was argued that in the present study the proportion of male teens in an area would be relevant to the amount of vandalism observed. This expectation, however, was not supported. Instead, the only age group identified as a significant predictor of higher levels of vandalism was males between 20-24.

Does this mean, then, that this group is responsible for committing the vandalism found in these areas? Such an attribution might seem justifiable, since males this age comprise the second-largest group of apprehended vandals, after teens. Moreover, the presence of large proportions of young male residents has been linked to higher neighbourhood levels of crime of other types (Allan and Steffensmeier 1989). Yet an alternate explanation for this finding is possible, again based not upon the assumed criminality of these residents but on the routine daily activities most likely to characterize areas where they predominate.

Males in this age group have not only been identified as likely offenders; they also represent the largest group of *victims* of crime, an observation that has been attributed to lifestyle factors (Hindelang, Gottfredson and Garofalo, 1978). Compared to other residents, young males are more likely to be away from home, both during the day and in the evening. In addition, they are less likely to live with primary family members, so that other members of their households may also spend greater amounts of time away from home. The implication of these observations for the present study is that in areas where a large proportion of residents are males in their twenties, fewer residents may be at home at any given time to exercise the sort of informal surveillance that enhances guardianship. Therefore more vandalism may occur in these areas, not because of the greater criminality of residents, but because of the opportunities presented by unguarded targets.

Physical structures in the environment. Shopping malls and secondary schools were the final group of variables examined in this study. Based upon previous literature which had found that the presence of such facilities contributed

to higher crime levels in surrounding neighbourhoods, it was expected that higher levels of vandalism would be observed in areas where these structures were located. The presence of a mall in an area was found to predict a significant increase in the amount of vandalism observed according to all three measures, an effect that was identified in almost every subsample. The effect for high schools was somewhat weaker and less consistent, but was still found to contribute significantly to higher vandalism of all three types in surrounding areas. It was argued that these effects would occur because both malls and schools are public structures which generate a steady influx of people into their environs. The increased traffic that results not only contributes to the convergence of potential offenders; it also impedes guardianship by making it more difficult to distinguish loiterers with a legitimate purpose from those with an illegitimate one. The consistent effects found for the presence of these facilities, when the residential environment was controlled for, lends support to this argument.

Revised model predicting vandalism according to routine activities

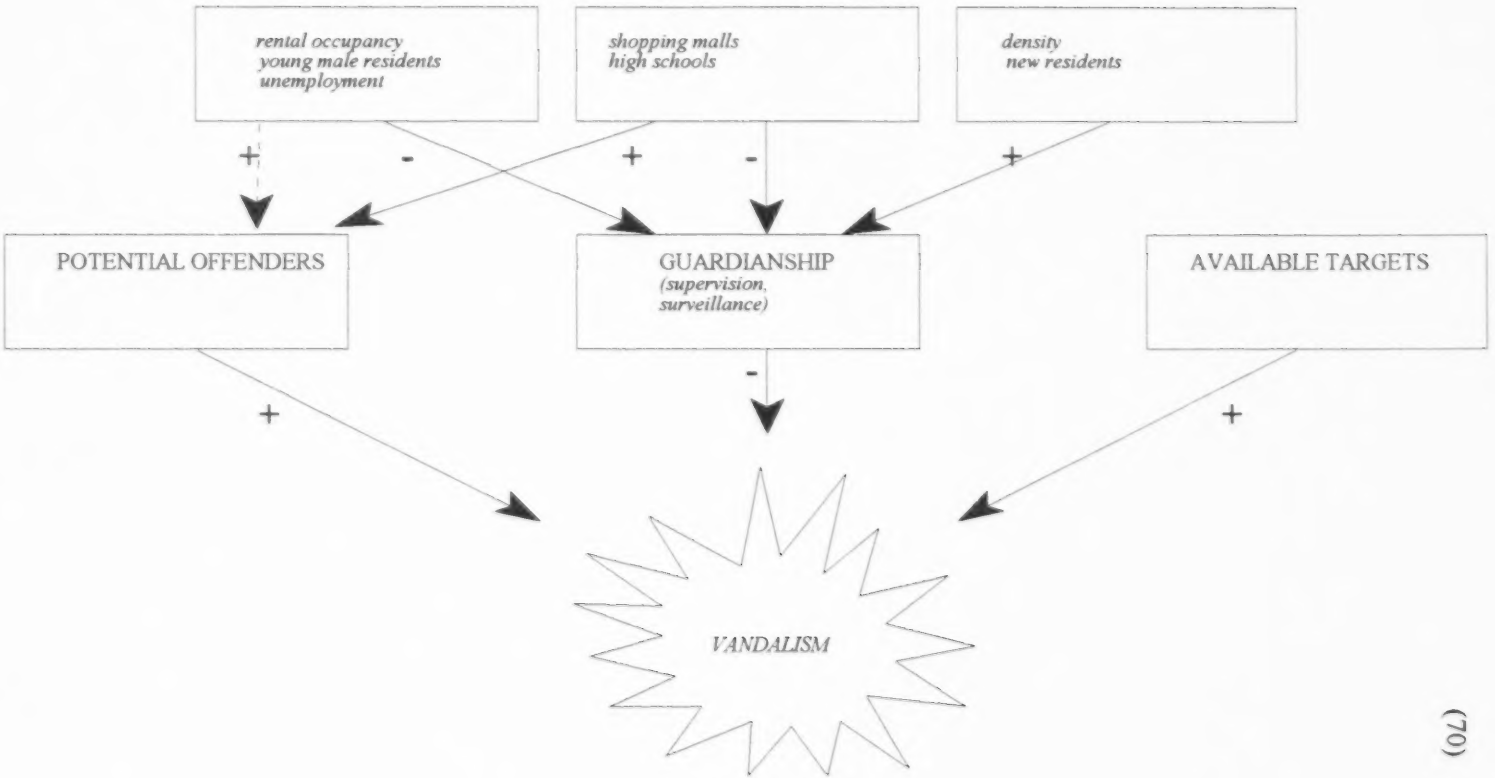
In keeping with the results found in this study, some revisions in the model presented in Chapter 2 are required. The revised model predicting vandalism according to routine activities theory *(Figure 5)* contains, for the most part, the same elements as the previously proposed model.[17] Vandalism is portrayed as being the product of the convergence of potential offenders and available targets, in circumstances of reduced guardianship. However, the proportion of new residents in an area is identified as *increasing* guardianship, rather than decreasing it. The most significant departures in this model from the earlier one are observed for the component of "potential offenders." The environmental structures (malls and high schools) are identified as reducing guardianship, and contributing to the convergence of offenders. The residential environment created by high unemployment, high rental occupancy and a larger number of young male residents also works to impede effective guardianship, but the relationship between these circumstances and the convergence of potential offenders is less clear. It has been well-documented in the self-report literature that male teens commit an enormous amount of vandalism, and they may therefore be the *most likely* offenders. Whether or not they are residents of areas where vandalism occurs or outsiders, however, cannot be determined from the results reported in this study. Thus, the relationship between the residential environment and potential offenders is represented by a broken line.

---

[17] The coefficents have not been included in this model, because the magnitude of effects differed according to the three different measures of vandalism used. Thus, the diagram represents general relationships rather than specific direct and indirect effects.

FIGURE 5

REVISED MODEL PREDICTING VANDALISM
According to Routine Activities Theory



CONCLUSION

Social control and the ecology of crime

The central premise of this study was that variations in the amount of vandalism that occurred in different regions of the City could be explained, not by differences in criminal motivation, but by the patterns of human activity engendered by the social and physical characteristics of areas. Thus the reported results have been interpreted as the interaction of potential vandals with the physical environment, in circumstances of reduced guardianship; but who these vandals are remains unknown. In an effort to demonstrate that it is neither necessary nor justifiable to attribute area rates to the criminality of residents, the arguments advanced have deliberately excluded motivation.

The issue first raised in Chapter 2 therefore deserves further attention. Does predicting *where* vandalism is most likely to occur and the circumstances that permit it offer any explanation of the behaviour, or is it merely an atheoretical exercise in description? Or, phrased differently, do the opportunities presented by the circumstances in certain areas actually shape the motivation to act, or do they merely provide a setting for behaviour that would inevitably occur somewhere? (Sherman, Gartin and Buerger 1989) The answers to these questions are relevant, not only for theoretical reasons but because of their implications for policies designed to reduce vandalism. If vandalism occurs in certain locations because motivated offenders seek out opportunities to wreak their damage, then identifying those locations, and concentrating on prevention in them, will do little except displace the criminal inclinations of offenders to other areas.

Cohen and Felson argue that the inclination to criminality may remain static, but the opportunities to commit crime may fluctuate according to variations in patterns of routine human activities (Cohen and Felson 1980: 397). This assertion may be particularly accurate with respect to vandalism. A number of self-report studies have found that this type of destructive behaviour is so common among adolescent males as to be almost normal (Clarke 1978). As many as 90% of teens in these studies admit to committing the occasional act of vandalism (Beaulieu 1982; Erickson and Empey 1963; Gladstone 1978). Hence the motivation for the behaviour may be argued to pre-exist, and explanations for its incidence might legitimately examine the circumstances under which it occurs. These circumstances, consisting of an available target, a group of young males, and little likelihood of apprehension, may contribute directly to the commission of acts that *might not otherwise* occur.

Although this perspective has been described as "environmental determinism," it embodies a view of human behaviour as the product of the weighing of risks (fear of being caught) and benefits (doing something daring, being one of the group). Moreover, it is analogous to the fundamental concepts of control theory, which asserts that deviant behaviour is an "omnipresent vulnerability," arguing that we would all be deviant if we dared and if we were not restrained by social and cultural restrictions (Hirschi 1969; Kornhauser 1978: 24). Hirschi's development of this theoretical paradigm is the best known, and has been extensively examined; but the emphasis in his model on the internal locus of control fostered by socialization and bonding to the conventional social order, as represented by parents and the school, would seem to have little relevance for vandalism. Clearly, 90% of youths cannot be inadequately socialized, or fail to have adequate parental ties.

Nye's earlier four-part typology, however, makes explicit distinctions between direct and indirect, and internal and external social control, and identifies all of these as significant factors in the occurrence of crime, either inhibiting it by their presence or permitting it by their absence (Nye 1958). The element described as direct, external control entails supervision and surveillance, intended to deter or prevent criminal acts; this factor, in turn, is directly equivalent to the concept of guardianship which has been suggested as being central in the occurrence of vandalism. It may well be that the epidemic of vandalism in contemporary urban settings is at least partially a product of the weakened social control inherent in modern life, both on a city-wide scale and as it develops in specific neighbourhood circumstances due to normal routine activities.

Implications

These assertions cannot be adequately evaluated in the context of the present study. Nevertheless, they suggest a possible explanation, not only for why vandalism is more prevalent in certain areas, but also for the more general circumstances under which it occurs. If weakened social control as implicit in reduced guardianship actually contributes to the occurrence of the behaviour, then enhancing guardianship might do more than simply displace it; it might actually reduce such behaviour. This argument has a number of implications both for future research and for preventive efforts by frequently victimized agencies.

Implications for research. Most research on vandalism has been concerned with documenting the behaviour rather than explaining it. Where explanations are advanced, they are often couched in terms of the classical theories of delinquency and the dispositional factors that lead some youths to commit deviant acts. The

widespread commission of vandalism by a majority of youths, however, combined with the links to routine activities identified in the present research, suggest that more attention might profitably be directed to situational factors. Future research examining the role of premeditation, the influence of companions, the availability of targets, and the perception of guardianship could provide a better understanding of the dynamics of vandalism. This type of research might best be carried out through questionnaires administered to populations of potential offenders.

Situational studies such as this one would be improved by the inclusion of a greater number of variables assessing the residential environment, as previously stated, and a more refined mapping of criminal incidents than is possible with census enumeration areas. In addition, vandalism is a particularly difficult type of crime to measure. Future studies of its geographical distribution would be enhanced by a systematic and consistent method of measurement. Where the participation of multiple agencies is involved, a mutually-accepted convention in evaluating damage would result in greater comparability.

A third type of research which these results suggest is the evaluation of program impact. If, as has been argued, vandalism arises as a response to perceived opportunities, then the implementation of programs (as suggested below) in one area could be expected to reduce vandalism in that area without displacing it to others. Comparison of rates of occurrence in different areas and within different time periods might demonstrate this, thereby providing reassurance to administrators seeking to reduce damage, while lending further support to a routine activities explanation for vandalism.

Recommendations for policy. Although public outrage over vandalism as a visible symbol of youth crime has led to demands that apprehended offenders be given severe penalties, such as approach would be unlikely to deter the behaviour. The extent to which punishment serves as a deterrent to crime remains controversial, but research on this issue has suggested that its effectiveness is contingent on the certainty of getting caught (Gibbons 1982: 454; Griffiths and Verdun-Jones 1989: 326). If offenders have little expectation of apprehension then the possibility of punishment, no matter how severe, may be too remote to have much effect. The fact that only an estimated 10% of vandals are caught means that most of the perpetrators, realistically, have little to fear from legal consequences. This does not mean that publicizing the problem of vandalism and its consequences can, or should be, abandoned. Although vandalism is "almost normal" behaviour, an aggressive campaign aimed at teens as representing the population of potential offenders might, in the long run, result in both increased awareness and changed attitudes (Klippert 1992; Monaghan 1987). But it might be expected that such an outcome would be very gradual, since it involves a process of re-socialization. More immediate and

therefore more cost-effective efforts, however, are suggested by the findings of the present research.

That so many youths vandalize on occasion, and that almost any available structure or surface can be damaged, imply that little can be done to control either the convergence of offenders or the availability of targets in the modern urban environment. It is therefore the element of guardianship that would seem to be most open to manipulation. Guardianship can be enhanced by a number of measures, which can be classified as either *active* or *passive*.

(1) Active guardianship. Would-be vandals need to have a certain amount of time and unsupervised access to targets in order to inflict damage. If surveillance and supervision of structures in highly-vulnerable areas is enhanced, these measures might effectively reduce the amount of vandalism which occurs, by reducing opportunity. Surveillance can be increased through a number of structured and semi-structured programs (Christiansen 1983). The most structured of these programs generally require some community involvement, and may entail specific initiatives such as having local school children "adopt" a neighbourhood facility (Markus 1984; Thayer and Coleman 1981). At a more general level, "Neighbourhood Watch" programs or citizen patrols, often instituted as part of a larger anti-crime initiative, can be effective as means of increasing surveillance of local structures.

The extent to which these programs entail neighbourhood or community participation can be problematic, however, particularly for the areas which have been identified as being most vulnerable to vandalism: the lower income areas, marked by high unemployment and high rentals. In these areas, the participation of local commercial and business establishments may be more successfully enlisted.

(2) Passive guardianship. Where neighbourhood involvement is not a realistic possibility, target-hardening or target-softening approaches can be instituted in high-vandalism areas (Geason and Wilson 1990). "Target-hardening", as the term implies, involves making frequent targets as strong and invulnerable as possible, and there are a multitude of specific measures which have been developed to accomplish this. The underlying premise of all such measures is that would-be offenders will be required to expend greater effort and more time to damage these durable and highly resistant structures. This approach can be very successful if it is combined with increased surveillance, which serves to limit the element of time. Where such surveillance cannot be exercised, however, and vandals have extended periods of uninterrupted access, the effectiveness of target-hardening is limited. Any structure, no matter how impregnable, can be damaged or destroyed given enough time and persistent effort on the part of would-be vandals. When such damage does occur to these "indestructible" facilities, the replacement costs are often much higher than

they would be otherwise, since the damage-resistant materials and designs used may be very expensive. Thus, some writers have argued that the least guarded and most frequently vandalized structures should be designed with "target-softening" in mind (European Conference of Ministers of Transport 1989; Jamieson 1987). Rather than using expensive materials to construct a facility which will soon be destroyed and require replacement, this approach involves using construction materials that are easily maintained or replaced, so that immediate and frequent repairs may be made.

A combination of measures designed to increase both active and passive guardianship, aimed specifically at those locations most at risk for high rates of vandalism, would seem to offer the best strategies for reducing vandalism. Specific measures which can be taken to implement these general recommendations are discussed in greater detail elsewhere, and are not listed here (LaGrange 1992).

REFERENCES

Agresti, Alan and Barbara Finlay. 1986. *Statistical Methods for the Social Sciences.* 2nd Ed. San Francisco: Dellen Publishing Co.

Allan, Emilie Andersen and Darrell J. Steffensmeier. 1989."Youth, Underemployment, and Property Crime: Differential Effects of Job Availability and Job Quality on Juvenile and Young Adult Arrest Rates." *American Sociological Review* 54: 107-123.

Beaulieu, Lucien (chair). 1982. *Vandalism: Responses and Responsibilities.* Report of the Task Force on Vandalism. Province of Ontario: Queen's Printer.

Bell, Maurice M., Merlyn M. Bell and Kay Godefroy. 1988. "The Impact of Graffiti on Neighbourhoods and One Community's Response." Presentation at *The International Symposium on Vandalism: Research, Prevention, and Social Policy.* Seattle, Washington.

Bohrnstedt, George W. and David Knoke. 1988. *Statistics for Social Data Analysis.* 2nd Ed. Itasca, Illinois: F. E. Peacock Publishers, Inc.

Bollen, Kenneth A. and Sally Ward. 1980. "Ratio variables in aggregate data analysis." in *Aggregate Data: Analysis and Interpretation,* edited by Edgar F. Borgatta and David J. Jackson. Beverly Hills, California: Sage.

Bortnick, Barry. 1994. "Adventure gone awry ends bright future." *Santa Barbara News-Press.* March 3: A1.

Bursik, Robert J. Jr. 1986. "Delinquency rates as sources of ecological change." in *The Social Ecology of Crime*, edited by James Mr. Byrne and Robert J. Sampson. New York: Springer-Verlag.

_____. 1988. "Social Disorganization and Theories of Crime and Delinquency: Problems and Prospects." *Criminology* 26(4): 519-551.

Canadian Criminal Code. 1990. *Pocket Criminal Code*, edited by Gary P. Rodriques. Toronto: Carswell.

Chalfant, Harry. 1992. "No One is in Control." in *Vandalism: Research, Prevention and Social Policy*, edited by Harriet H. Chistensen, Daryll R. Johnson and

Martha H. Brookes (technical coordinators). Portland, Oregon: U. S. Department of Agriculture Forest Service.

Challinger, Dennis (ed.). 1987. *Preventing Property Crime: Proceedings of a Seminar.* Canberra: Australian Institute of Criminology.

Chambliss, William J. and Richard H. Nagasawa. 1969. "On the Validity of Official Statistics: A Comparative Study of White, Black, and Japanese High-School Boys." *Journal of Research in Crime and Delinquency.* 6: 71-77.

Chapman, J. 1980. *Economic Realities and the Female Offender.* Lexington, Mass.: D. C. Heath Co.

Chavarria, Jesse. 1994. "Compassion necessary if we're to get along." *Santa Barbara News-Press.* March 12: B1.

Christiansen, Monty L. 1983. *Vandalism Control Management for Parks and Recreational Areas.* University Park, Pa.: Venture Publishing.

City of Edmonton Municipal Census. 1992. *Census summary data file.* Edmonton: City of Edmonton Computing Resources.

City of Edmonton Vandalism Committee. 1992. Minutes from meetings, July - September.

Clarke, R. V. G. (ed.). 1978. *Tackling Vandalism.* Home Office Research Study No. 47. London: Her Majesty's Stationery.

Cohen, Stanley. 1973. "Property destruction: motives and meanings." in *Vandalism*, edited by Colin Ward. New York: Van Nostrand Reinhold.

Croxton, Frederick E. and Dudley T. Cowden. 1946. *Applied General Statistics.* New York: Prentice-Hall, Inc.

Edmonton Police Service. 1992. *Mischief incidents data file.* Edmonton: Edmonton Police Service Research Department (unpublished).

Edmonton Public Housing Authority. 1994. (Telephone conversation, Housing Allocations General Manager. June 2).

Elliott, Michael. 1994. "Crime and Punishment." *Newsweek*, April 18: 18-22.

Engstad, Peter A. 1980. "Environmental Opportunities and the Ecology of Crime." in *Crime in Canadian Society* 2nd Ed., edited by Robert A. Silverman and James J. Teevan, Jr. Toronto: Butterworths.

Erickson, Maynard L. and Gary F. Jensen. 1977. "Delinquency is still Group Behavior!: Toward Revitalizing the Group Premise in the Sociology of Deviance." *Journal of Criminal Law and Criminology.* 68(2): 262-273.

Erickson, Maynard L. and Lamar T. Empey. 1963. "Court Records, Undetected Delinquency and Decision-Making." *Journal of Criminal Law, Criminology and Police Science* 54: 456-469.

European Conference of Ministers of Transport. 1989. *Delinquency and Vandalism in Public Transport.* Conference Proceedings. London: European Conference of Ministers of Transport.

Felson, Marcus and Lawrence E. Cohen. 1980. "Human ecology and crime: a routine activity approach." *Human Ecology* 8: 389-406.

Ferenc, Leslie. 1993. "Principal wages war on vandals." *Toronto Star* June 17: A1.

Feshbach, S. 1964. "The function of aggression and the regulation of aggressive drive." *Psychological Review* 71:257-272.

Figueira-McDonough, Josefina, William H. Barton and Rosemary C. Sarri. 1980. "Normal Deviance." in *Comparing Male and Female Offenders*, edited by Marguerite Warren. Beverly Hills, Calif.: Sage.

Funk & Wagnalls Standard Dictionary. 1987. New York: Funk & Wagnalls Publishing Company, Inc.

Geason, Susan and Paul R. Wilson. 1990. *Preventing Graffiti and Vandalism.* Canberra: Australian Institute of Criminology.

Gibbons, D. C. 1982. *Society, Crime and Criminal Behavior.* Englewood Cliffs, N. J.: Prentice-Hall, Inc.

Gladstone, F. J. 1978. "Vandalism amongst Adolescent Schoolboys." in *Tackling Vandalism*, Home Office Research Study No. 47, edited by R. V. G. Clarke. London: Her Majesty's Stationery.

Glazer, Nathan. 1981. "Scholar commentary" for *Style Wars* production. Unpublished.

Gold, Martin. 1970. *Delinquent Behavior in an American City.* Belmont, California: Brooks/Cole.

Gorman, Wayne. 1993. Edmonton Department of Parks and Recreation Security and Risk Management Administrator (Interviews, June-September).

Gottfredson, Michael R. and Travis Hirschi. 1990. *A General Theory of Crime.* Stanford: Stanford University Press.

Green, Morgan. 1993. "Graffiti investigator may be signed on." *Santa Barbara News-Press*, October 10: B1.

Griffiths, Curt T. and Simon N. Verdun-Jones. 1989. *Canadian Criminal Justice.* Toronto and Vancouver: Butterworths.

Hagan, John, A. R. Gillis and J. Chan. 1978. "Explaining official delinquency: A spatial study of class conflict and control." *Sociological Quarterly* 19: 386-398.

Harries, Keith. 1993. "The Ecology of Homicide and Assault: Bltimore City and County, 1989-1991." Paper presented at ASC Annual Meeting. Pheonix, Arizona (November 4).

Hartnagel, Timothy F. and G. Won Lee. 1990. "Urban crime in Canada." *Canadian Journal of Criminology.* October: 591-606.

Hindelang, Michael J., Michael R. Gottfredson, and James Garofalo. 1978. *Victims of Personal Crime: An Empirical Foundation for a Theory of Personal Victimization.* Cambridge, Mass.: Ballinger.

Hindelang, Michael J., Travis Hirschi, and Joseph Weis. 1979. "Correlates of Delinquency: The Illusion of Discrepancy Between Self-Report and Official Measures." *American Sociological Review*. 44: 995-1014.

Hirschi, Travis. 1969. *Causes of Delinquency*. Berkeley, Calif.: University of California Press.

Hough, Mike and Pat Mayhew (eds.). 1980. *Crime and Public Housing: Proceedings of a Workshop*. London: Home Office.

Jamieson, Bill. 1987. "Public Telephone Vandalism." in *Preventing Property Crime*, edited by Dennis Challinger. Canberra, Australia: Proceedings of a Seminar (November 24-25), Australian Institute of Criminology.

Kennedy, Leslie W. and Robert A. Silverman. 1991. "The elderly victim of homicide: An application of routine activities approach." in *Crime in Canadian Society* 4th Ed., edited by Robert A. Silverman, James J. Teevan Jr., and Vincent F. Sacco. Toronto: Butterworths.

Klippert, Jan. 1992. "Reduction of Vandalism to Traffic Control Signs in King County, Washington." in *Vandalism: Research, Prevention and Social Policy*, edited by Harriet H. Chistensen, Daryll R. Johnson and Martha H. Brookes (technical coordinators). Portland, Oregon: U. S. Department of Agriculture Forest Service.

Kornhauser, Ruth R. 1978. *Social Sources of Delinquency*. Chicago: University of Chicago Press.

Kowalchuk, Darlene. 1993. Edmonton Transit Security and Risk Management Administrator. (correspondence dated June 30).

LaGrange, Teresa C. 1992. *Vandalism: A Review of Programs*. Edmonton: Edmonton Vandalism Prevention Committee (unpublished).

Lalu, N. M. 1989. *Changing Profiles of Edmonton Census Tracts*. Edmonton: University of Alberta Population Research Laboratory.

.Levy-Leboyer, Claude (ed.). 1984. *Vandalism: Behaviour and Motivations*. Amsterdam/New York/Oxford: North-Holland.

Lindberg, Anne. 1994. "Victims of vandalism." *St. Petersburg Times.* January 11: B1.

Markus, C. L. 1984. "British Telecom Experience in Payphone Management." in *Vandalism: Behaviour and Motivations,* edited by Claude Levy-Leboyer. Amsterdam/New York: North-Holland.

Monaghan, Laurie. 1987. "Anatomy of a Crime Prevention Publicity Campaign." in *Preventing Propoerty Crime*, edited by Dennis Challinger. Canberra: Australian Institute of Criminology.

Moser, Gabriel. 1992. "What is Vandalism? Towards a Psycho-social Definition and its Implications." in *Vandalism: Research, Prevention, and Social Policy,* edited by Harriet H. Chistensen, Daryll R. Johnson and Martha H. Brookes (technical coordinators). Portland, Oregon: U. S. Department of Agriculture Forest Service.

Nettler, G. 1984. *Explaining Crime.* 3rd Ed. New York: McGraw-Hill.

Newman, Oscar. 1973. *Defensible Space.* New York: Collier Books.

Nye, F. Ivan. 1958. *Family Relationships and Delinquent Behavior.* New York: Wiley.

Park, Robert E. and Ernest W. Burgess 1933. *Introduction to the Science of Sociology.* 2nd Ed. Chicago: University of Chicago Press.

Reiss, A. J. 1976. "Setting the frontiers of a pioneer in American criminology: Henry McKay." in *Delinquency, Crime and Society,* edited by J. F. Short, Jr. Chicago: University of Chicago Press.

Robinson, W. S. 1950. "Ecological correlation and the behavior of individuals." *American Sociological Review* 15: 351-357.

Roncek, Dennis and Antoinette LoBosco. 1983. "The effect of high schools on crime in their neighborhoods." *Social Science Quarterly* 64: 598-613.

Roncek, Dennis W. and Donald Faggiani. 1985. "High schools and crime: a replication." *The Sociological Quarterly*. 26(4): 491-505.

Roos, Hans-Edvard. 1992. "Vandalism as a Symbolic Act in 'Free-Zones.'" in *Vandalism: Research, Prevention, and Social Policy,* edited by Harriet H. Chistensen, Daryll R. Johnson and Martha H. Brookes (technical coordinators). Portland, Oregon: U. S. Department of Agriculture Forest Service.

Sampson, Robert J. 1993. "Linking time and Place: Dynamic Contextualism and the Future of Criminological Inquiry." *Journal of Research in Crime and Delinquency.* Vol. 30(4): 426-444.

_____. 1987. "Communities and Crime." in *Positive Criminology,* edited by Michael R. Gottfredson and Travis Hirschi. Beverly Hills: Sage.

Sampson, Robert J. and W. Byron Groves. 1989. "Community Structure and Crime: Testing Social-Disorganization Theory." *American Journal of Sociology.* Vol. 94(4): 774-802.

Schmid, Calvin. 1983. *Statistical Graphics.* New York: Wiley.

Shaw, Clifford R. and Henry D. McKay. 1969. *Juvenile Delinquency and Urban Areas.* 2nd Ed. Chicago: University of Chicago Press.

Sherman, Lawrence W., Patrick R. Gartin and Michael E. Buerger. 1989. "Hot Spots of Predatory Crime: Routine Activities and the Criminology of Place." *Criminology* 17(1): 17-49.

Short, James F., Jr. and F. Ivan Nye. 1957. "Reported behavior as a criterion of deviant behavior." *Social Problems* 5: 207-13.

Silverman, Robert A., James J. Teevan Jr. and Vincent F. Sacco. 1991. *Crime in Canadian Society.* 4th Ed. Toronto: Butterworths.

Simpson, John H. and John Hagan. 1985. *Evaluation of a Vandalism Prevention Project.* Ottawa: Ministry of the Solicitor General.

Smith, Douglas A. and Christy A. Visher. 1980. "Sex and involvement in deviance/crime: a quantitative review of the literature." *American Sociological Review* 45: 691-701.

Snedecor, George W. 1946. *Statistical Methods.* 4th Ed. Ames, Iowa: Iowa State College Press.

Snodgrass, Jon 1976. "Clifford R. Shaw and Henry D. McKay: Chicago Criminologists." *The British Journal of Criminology.* Vol. 16(1): 1-19.

Solicitor General of Canada. 1983. *Canadian Urban Victimization Survey. Bulletin No. 2: Reported and Unreported Crimes.* Ottawa: Programs Branch, Research and Statistics Group.

Stewart, James. 1991. *Single Variable Calculus.* 2nd Ed. Pacific Grove, California: Brooks/Cole Publishing Company.

Thayer, Ralph and Fritz Coleman. 1981. *Vandalism: a Menace to Leisure Resources in the 1980's.* Alexandria, Va.: National Recreation and Park Association.

United States Federal Bureau of Investigation. 1987. *Uniform Crime Reports.* U. S. Department of Justice, Federal Bureau of Investigation: Washington, D. C.

United States Federal Bureau of Investigation. 1986. Appendix II, "Crime in The U.S." *Uniform Crime Reports.* U. S. Department of Justice, Federal Bureau of Investigation: Washington, D. C.

van Vliet, Willem. 1992. "The Cherry Question or the Role of Social Science Research in Designing Against Vandalism." in *Vandalism: Research, Prevention, and Social Policy,* edited by Harriet H. Chistensen, Daryll R. Johnson and Martha H. Brookes (technical coordinators). Portland, Oregon: U. S. Department of Agriculture Forest Service.

Walop, Martin. 1988. "The development of an effective approach towards vandalism by means of action research." in *Proceedings of the International Symposium on Vandalism.* Seattle, Washington: International Symposium on Vandalism.

Webb, S. D. 1972. "Crime and the division of labor: Testing a Durkheimian model." *American Journal of Sociology* 78: 643-656.

Wilson, Sheena. 1978. "Vandalism and 'defensible space' on London housing estates." in *Tackling Vandalism*. Home Office Research Study No. 47, edited by R. V. G. Clarke. London: Her Majesty's Stationery.

Wise, James. 1982. "A gentle deterrent to vandalism." *Psychology Today*. September: 31-38.

APPENDIX A

GEOCODING OF DATA

In order to evaluate the spatial distribution and characteristic patterns of the data, all records were assigned to specific locations on a map. MapInfo, the computer mapping program used in the present analysis, accomplishes this by matching two data files: a base map file, which contains information on the x,y coordinates that corresponds to each location on the map; and a set of data, which must contain a geographic referent such as an address. The base map may correspond to a variety of topographical units, including areas such as census tracts or postal code regions. In order to successfully link the data set of interest to the map, records must contain a geographic indicator of the same type. They may then be matched to the base map in a process referred to as geocoding, which assigns individual x,y coordinates to each record.

For the current study on vandalism incidence, two base maps were used. The first of these, a computerized street map of the City of Edmonton, contains all streets and block numbers for all addresses within the City from the 1986 census. It was obtained from the software distributor for MapInfo. The second base map, consisting of census enumeration areas, was derived from the street map by specifying the boundaries for each region indicated in the 1992 City of Edmonton municipal census. The map was then matched to the census data file obtained from the City of Edmonton.

Although the process of geocoding is relatively straightforward in principle, it can be complex in practice, depending on the nature of the data. Each of the three data sets used as a measure of vandalism came from a different City department, and had been recorded differently; hence, each presented special challenges in geocoding. They are therefore dealt with separately in the discussion below.

Mischief incidents

The data file on mischief incidents obtained from the Edmonton Police Service contained 13537 recorded incidents for the year 1992. Of these, the addresses for 147 incidents had been recorded as unknown. Elimination of these cases left 13390 valid records, which were then cross-referenced with the address file contained in the base map. In this first attempt at geocoding, 8779 (65.6%) addresses were successfully identified. This meant that 4617 records, or 34.4%, had not been located. Moreover, these cases were found to be non-random, consisting primarily of three types of records: (1) a named building or location had been recorded instead of an address; (2) an intersection had been specified; or (3) the

address recorded was in a newer section of the City, where lot numbers had been assigned in the years since 1986.

For the first group of records, the street addresses for named buildings or facilities and the number equivalents for named streets was obtained and entered in the address for each record. The second group of records which failed to geocode automatically had been specified as an intersection rather than an address. For this type of record, geocoding to the address file could only be accomplished by assigning the incident to one of the four corners of an intersection. Since there was no way to determine which side of the street or avenue represented the most accurate choice, these records were all geocoded to the northwest corner of the intersection. The final and most problematic group of records were those which were located in newer sections of the City. For most of these cases, the specified street existed on the computer map, but block numbers read as "0" because no address codes had yet been assigned to these sections. Updated address codes, where possible, were obtained for the required blocks from updated City maps.

Following the completion of these interactive stages of geocoding, all but 259 cases were successfully located upon the City map. These cases appeared to be non-random, referring primarily to addresses in the newest neighbourhoods in the City, which were empty sections on the computerized map from 1986. However, these cases represented a very small number of the original data set (1.9%). They were therefore treated as missing cases. Of the original police data file of 13537 cases, 13131 cases in total (97%) were successfully geocoded and subsequently used in the statistical analysis.

Transit vandalism

Locations for incidents of vandalism to Edmonton Transit bus stops and shelters were described as intersections. However, a route direction was also indicated for each incident. For these data, the route direction was therefore used as an indicator of which corner of the intersection to use for geocoding. Most streets in the city run north and south, while avenues run east and west. The exceptions to this rule are curved named roads, which may take one of several different directions. Since each intersection includes a cross-street, however, it was possible to determine which direction these records referred to. All incidents, therefore, were coded according to the indicated direction: eastbound was geocoded to the north side of avenues and westbound to the south side; northbound to the east side of streets and southbound to the west side. Of the 1337 incidents, 1319 (98.6%) were successfully geocoded. The remaining 18 cases represented 1.3% of the original records; these consisted of 7 cases which did not correspond to a known intersection on the map,

and 11 which were ambiguous and might have applied to more than one intersection. These were treated as missing cases.

Parks and recreation vandalism

Parks and recreation vandalism incidents were recorded according to the park or facility where they occurred rather than a street address. All named major parks were initially located on the computer map, using maps prepared by the Department of Parks and Recreation. Vandalism incidents were then geocoded to these. Each record also indicated a structure or type of structure such as a pool or fieldhouse; hence, for very large parks, this portion of the record was used to refine point of location further. Out of the 402 incidents recorded during 1992, all but 9 (2.2%) were successfully geocoded, resulting in 393 usable cases (97.8%).

APPENDIX B

VARIABLES USED IN THE ANALYSIS

Mallin. Presence of a major shopping mall within the area (dummy variable, with presence = "1" and absence = "0").

Malladj. Presence of a major shopping mall within an immediately adjacent area (dummy variable, with presence = "1" and absence = "0").

Highsc. Presence of a public high school (dummy variable, with presence = "1" and absence = "0").

Jrhs. Presence of a public junior high school (dummy variable, with presence = "1" and absence = "0").

Chis. Presence of a separate-district high school (dummy variable, with presence = "1" and absence = "0").

Cjrhi. Presence of a separate-district junior high school (dummy variable, with presence = "1" and absence = "0").

Areasqkm. Total size of each area, calculated in square kilometres.

Sumpop. The total resident population of each area, as reported by the Municipal Census (1992).

Pfem1. The proportion of area residents who are females between 10-14 years of age.

Pfem2. The proportion of area residents who are females 15-19 years of age.

Pmale1. The proportion of area residents who are males 10-14 years of age.

Pmale2. The proportion of area residents who are males 15-19 years of age.

Pmale3. The proportion of area residents who are males 20-24 years of age.

Pnewp. The proportion of area residents who have lived at their present address less than 1 year. This includes those from elsewhere in the City, those from

elsewhere in the Province, those from outside the Province but within Canada, and those from outside Canada.

Popden. The total areal density, calculated as the average number of persons per square kilometre.

Prent. The proportion of residences which are renter-occupied.

Psingm. The proportion of male residents who listed their marital status as "single."

Punem. The proportion of residents who had indicated that they were unemployed (excludes children under 15 and those over 65).

Misc. The total number of mischief incidents reported by City Police to have occurred at an address within the boundaries of each area during the year of 1992.

Tranv. The total number of transit vandalism incidents reported by Edmonton Transit to a structure located within the boundaries of each area during the year of 1992.

Parv. The total number of park or recreational vandalism incidents reported by the Edmonton Department of Parks and Recreation which occurred within the boundaries of each area during the year of 1992.

APPENDIX C

SECONDARY SCHOOLS

A. Public School District

1. Junior High Schools

	NAME OF SCHOOL	ADDRESS
1	Avalon	5425 114 Street
2	Balwin	7055 132 Avenue
3	Britannia	16018 104 Avenue
4	Dan Knott	1434 80 Street
5	MacKenzie	4020 106 Street
6	Dickinsfield	14320 88 A Street
7	Edith Rogers	8308 Millwoods Road
8	Hardisty	10534 62 Street
9	Highlands	11509 62 Street
10	Hillcrest	16400 80 Avenue
11	Kenilworth	7005 89 Avenue
12	Killarney	13110 91 Street
13	Lawton	11602 40 Street
14	Londonderry	7104 144 Avenue
15	Ottewell	9435 73 Street
16	Ritchie	9750 74 Avenue
17	Riverbend	14820 53 Avenue
18	Rosslyn	13215 113 A Street
19	Steele Heights	14607 59 Street
20	Stratford	8715 153 Street
21	T. D. Baker	1750 Millwoods Road East
22	Vernon Barford	32 Fairway Drive
23	Wellington	13160 127 Street
24	Westlawn	9520 165 Street
25	Westminister	13712 104 Avenue
26	Westmount	11125 131 Street

2. Senior High Schools

	SCHOOL	ADDRESS
1	Bonnie Doon	8205 90 Avenue
2	Eastglen	11430 68 Street
3	Harry Ainlay	4350 111 Street
4	J. Percy Page	2707 Millwoods Road
5	Jasper Place	8950 163 Street
6	M. E. LaZerte	6804 144 Avenue
7	McNally	8440 105 Avenue
8	Old Scona Academic	10523 84 Avenue
9	Queen Elizabeth	9425 132 Avenue
10	Ross Sheppard	13546 111 Avenue
11	Strathcona	10450 72 Avenue
12	Victoria Composite	10210 108 Avenue
13	W. P. Wagner	6310 Wagner Road

B. Separate School District

1. Junior High Schools

	NAME OF SCHOOL	ADDRESS
1	Cardinal Leger	8808 144 Avenue
2	H. E. Beriault	8125 167 Street
3	J. J. Bowlen	6110 144 Avenue
4	St. Cecilia	8830 132 Avenue
5	St. Clare	11833 64 Street
6	St. Kevin	10005 84 Street
7	St. Mark	11625 135 Street
8	St. Nicholas	3643 115 Avenue
9	St. Rose	8815 145 Street
10	St. Thomas More	9610 165 Street
11	Sir John Thompson	13525 132 Avenue

2. High Schools

2.1 High Schools

SCHOOL		ADDRESS
1	Archbishop O'Leary	8760 132 Avenue
2	Austin O'Brien	6110 95 Avenue
3	Holy Trinity	7007 28 Avenue
4	St. Francis Xavier	9250 163 Street
5	St. Joseph	10830 109 Street
6	Archbishop MacDonald	10810 142 Street

2.2 Multi-level Schools (junior/senior)

SCHOOL		ADDRESS
1	J. H. Picard	7055 99 Street
2	Louis St. Laurent	11230 43 Avenue
3	Maurice Lavallee	8828 95 Street

APPENDIX D

MALLS

The following seventeen malls and shopping centres were included in the analysis.

	NAME OF MALL	ADDRESS
1	Abbottsfield Shopping Centre	34 Street & 118 Avenue
2	Bonnie Doon Shopping Centre	83 Street & 82 Avenue
3	Capilano Mall	5004 98 Avenue
4	Centennial Village Mall	170 Street & Stony Plain Road
5	Eaton Centre	10200 102 Avenue
6	Edmonton Centre	102 Avenue & 101 Street
7	Heritage Mall	2323 111 Street
8	Kingsway Garden Mall	109 Street & Kingsway Avenue
9	Londonderry Mall	66 Street & 137 Avenue
10	Meadowlark Shopping Centre	156 Street & 87 Avenue
11	Millbourne Shopping Centre	38 Avenue & Millwoods Road
12	Millwoods Town Centre	2331 66 Street
13	North Town Mall	97 Street & 137 Avenue
14	Northwood Mall	97 Street & 137 Avenue
15	Southgate Shopping Centre	111 Street & 51 Avenue
16	West Edmonton Mall	8770 170 Street
17	Westmount Shopping Centre	111 Avenue & Groat Road

APPENDIX E

CHOROPLETH MAPS

In order to graphically compare the differing amounts of vandalism observed in various areas of the City of Edmonton, several choropleth maps have been included in this research. The term choropleth, derived from the Greek words for "place" and "number" or "quantity," refers to the characteristic shading employed in the preparation of this type of map, to indicate different quantities or amounts of some variable of interest. For the present study, census enumeration areas were used as the unit of analysis, and hence these are the areal units shaded in the maps. Three different sets of shaded maps are presented, showing the amount of vandalism occurring in each area over a one year period according to each of the different measures of vandalism.

Because vandalism is an offence directed against the physical environment, and can therefore occur anywhere in the City including unpopulated industrial or downtown areas, a population-based rate was not calculated to represent the amount of incidence. At the same time, however, the population density of an area clearly has some implications for the amount of vandalism that might be expected. Thus both the population of an area and its overall size are important considerations in the amount of vandalism that might be observed; neither, alone, provides an adequate basis for forming a rate. This observation has been previously discussed as the rationale for introducing both measures, of size and population, in the statistical analysis. In the present instance, since neither one alone provides an adequate basis for constructing a rate, the maps present the absolute numbers for each of the three types of data.

This choice, however, also has an inherent shortcoming, at least potentially, in that larger areas appear to dominate the map more than smaller ones of the same shading (Schmid 1983: 111). There is, therefore, the possibility of visual distortion in the relative ranking of areas. This possibility did not prove to be of importance in the present analysis, however. With few exceptions, the highest-ranking areas are neither extremely small nor extremely large; they are relatively homogenous in size.

Each map is shaded similarly, in order to allow comparison between the maps. Shading of areas is from darkest, representing the greatest amount of vandalism, to lightest, representing the least. Eight intervals are used for both mischief incidents and transit vandalism. For park and recreational vandalism, however, the smaller number of cases did not permit distinction into eight categories; seven categories are therefore shown for this data.

There are several possible ways of determining the interval boundaries used for shading. One is to use intervals of the same size, as was done with the maps used here. A second possibility, using intervals which contain an equal number of cases, was rejected because the data to be presented in these maps, like most spatial data, do not conform to symmetrical distributions (Schmid 1983: 123). They are markedly skewed, with a small number of areas at the highest levels of incidence and a very large number of areas at the lowest. Equalizing the distribution by setting interval boundaries to include the same number of cases in each interval would severely distort the actual distribution. A third possibility, using natural breaks in the frequency distribution of each data set, was also rejected because it would have resulted in unequal intervals of odd sizes, and would have resulted in substantially different categories for each set of data, rendering comparison meaningless. Similarly, breaking categories based on the standard deviation was rejected for the same reasons.

A final point that should be kept in mind about maps of this type is that the use of areal shading within discrete boundaries creates an impression of definitive and abrupt change between one area and neighbouring areas. This is generally not the case, however; the transition is likely to be much more gradual from areas of high concentration to areas of lower concentration (Schmid 1983: 118).

APPENDIX F

DISTRIBUTION OF MALLS AND SECONDARY SCHOOLS IN COMPARISON TO LEVELS OF VANDALISM INCIDENCE

The maps on the following pages show the locations of malls and schools in relationship to the mapping of incidents of vandalism by the three measures.

Figure 6 shows the locations of public high schools and malls on the City map shaded according to the number of mischief incidents recorded by the police in each area.

Figure 7 shows the locations of public high schools and malls on the City map shaded according to the number of transit vandalism incidents.

Figure 8 shows the locations of public high schools and malls on the City map shaded according to the number of park vandalism incidents.

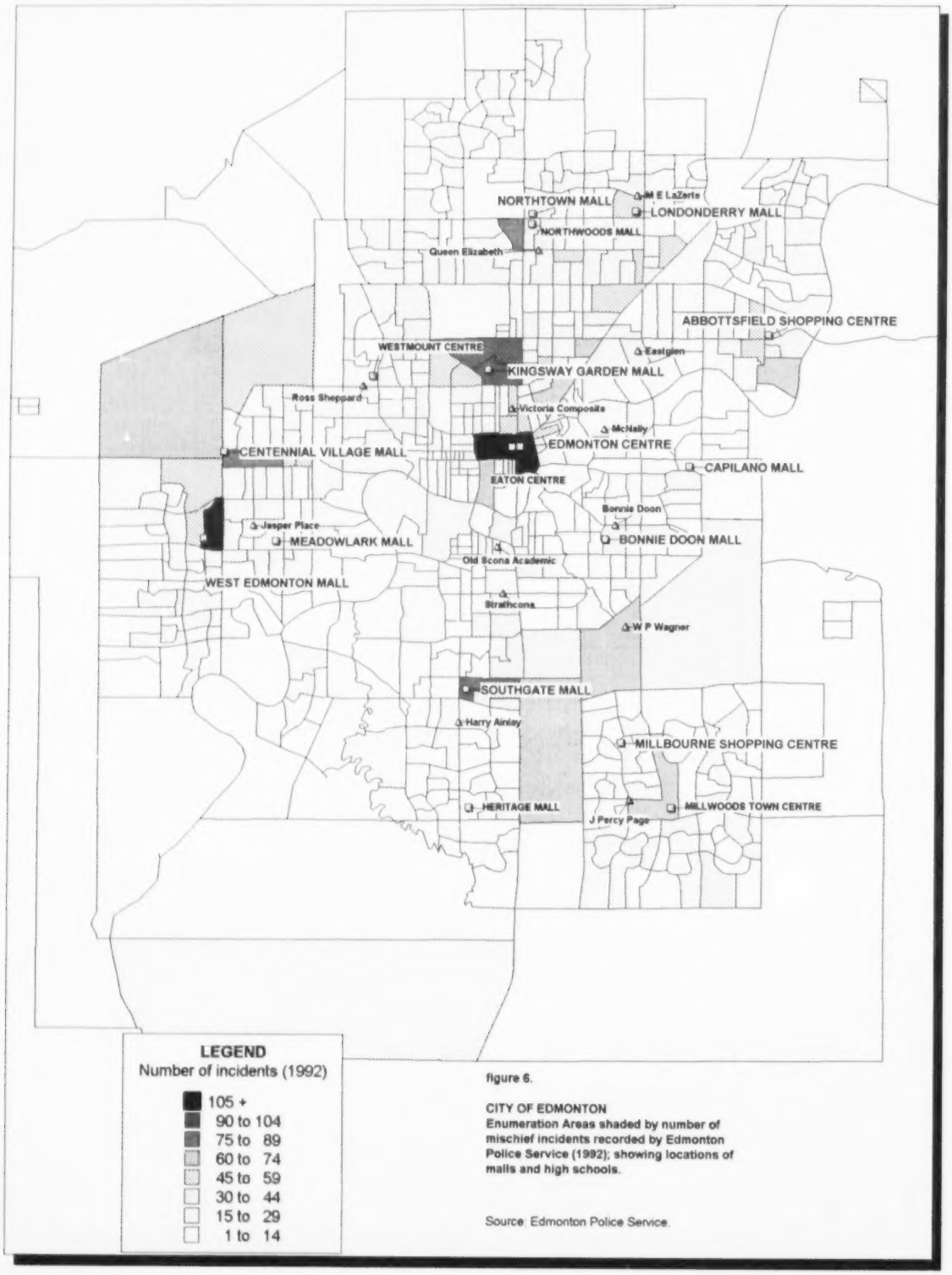


figure 6.

CITY OF EDMONTON
Enumeration Areas shaded by number of mischief incidents recorded by Edmonton Police Service (1992); showing locations of malls and high schools.

Source: Edmonton Police Service.

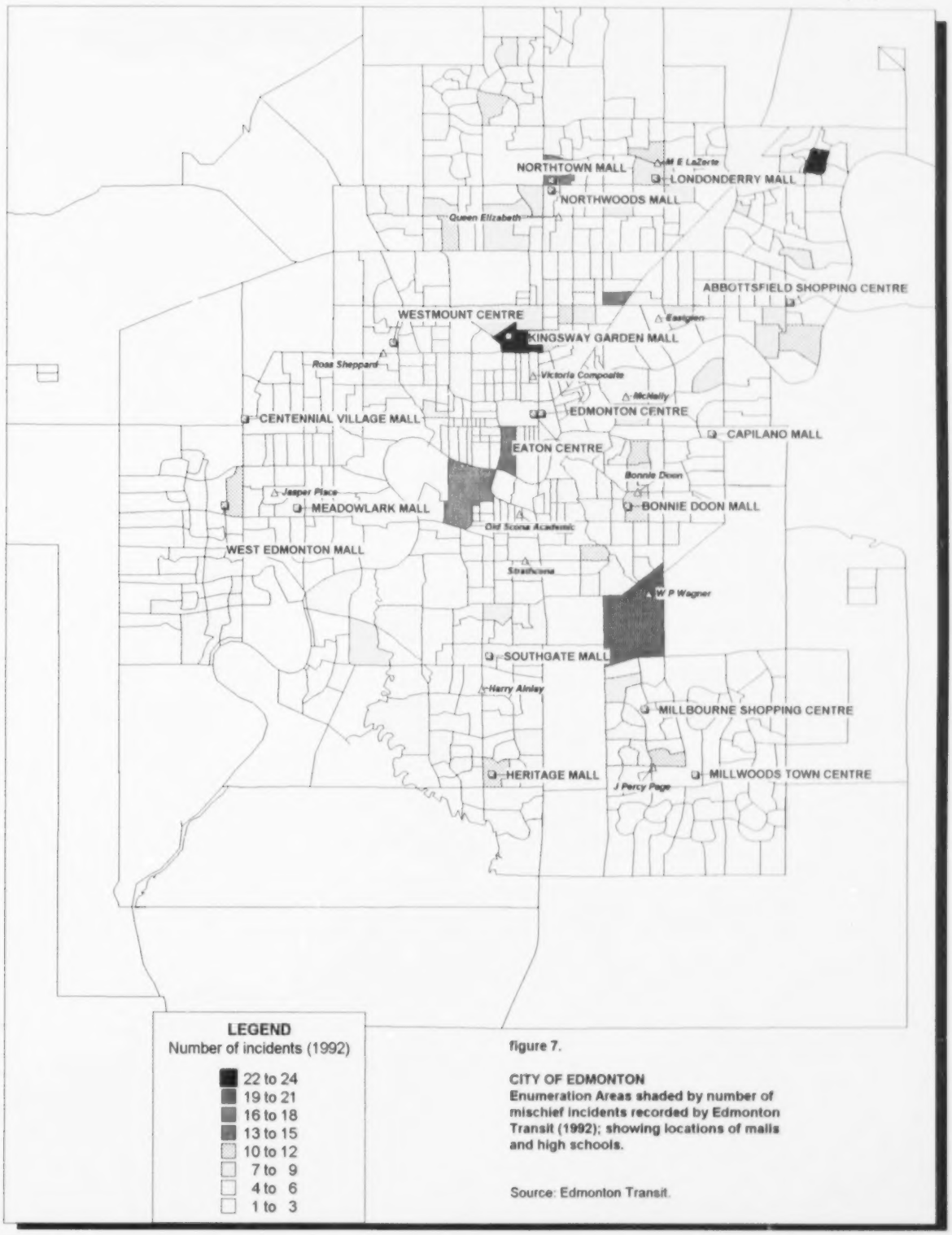


figure 7.

CITY OF EDMONTON
Enumeration Areas shaded by number of mischief incidents recorded by Edmonton Transit (1992); showing locations of malls and high schools.

Source: Edmonton Transit.

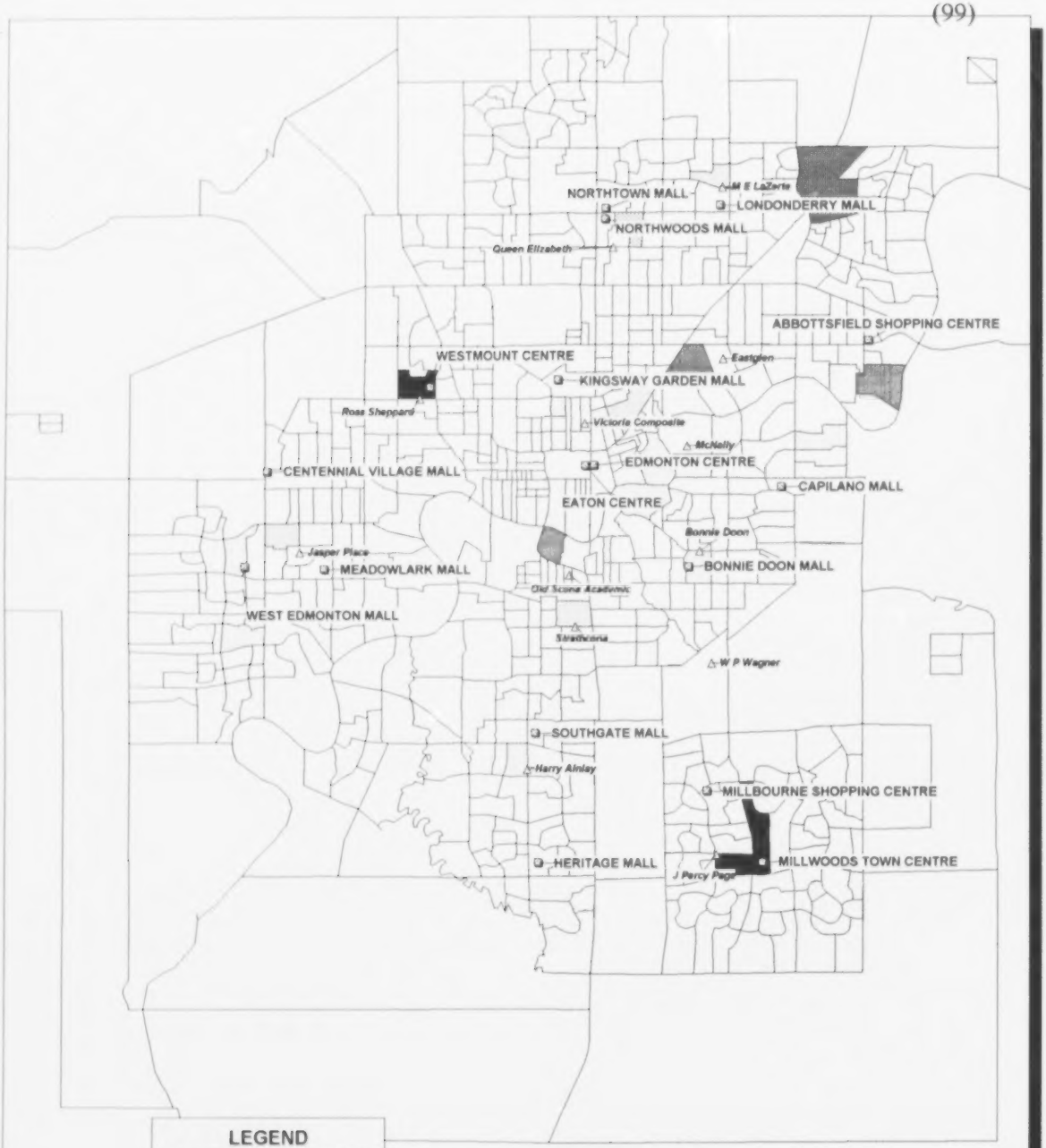


figure 8.

CITY OF EDMONTON
Enumeration Areas shaded by number of mischief incidents recorded by Edmonton Parks and Recreation (1992); showing locations of malls and high schools.

Source: Edmonton Parks and Recreation.